
BULLETIN

of the

Chicago Herpetological Society



Volume 35, Number 10
October 2000



BULLETIN OF THE CHICAGO HERPETOLOGICAL SOCIETY

Volume 35, Number 10

October 2000

Comparison of Growth, Behavior, Parasites and Oral Bacteria of Brazos Water Snakes, <i>Nerodia harteri harteri</i> , Raised in an Outdoor Enclosure with Related Specimens Raised Indoors	John Rossi, DVM, and Roxanne Rossi	221
Additional Notes on Native and Non-native Turtles of the Rio Grande Drainage Basin, New Mexico	James N. Stuart	229
Book Review: <i>Amphibians and Reptiles of Texas: With Keys, Taxonomic Synopses, Bibliography, and Distribution Maps</i> , Second Edition, by James R. Dixon	Ernest A. Liner	236
Herps in Hollywood: <i>Frogs</i>	John Kostka	237
HerPET-POURRI	Ellin Beltz	238
Herpetology 2000		241
The Tympanum	Daniel Diessner and Robert George Sprackland	244
Unofficial Minutes of the CHS Board Meeting, September 15, 2000		246
Advertisements		248

Cover: Red-eared slider, *Trachemys scripta elegans*, from DuPage County, Illinois. Photograph by Michael Redmer.

STAFF

Editor: Michael A. Dloogatch

Advertising Manager: Ralph Shepstone

2000 CHS Board of Directors

Jack Schoenfelder, President

Lori King, Vice-President

Gary Fogel, Treasurer

Karen Bielski, Recording Secretary

Steve Spitzer, Corresponding Secretary

Marcia Rybak, Publications Secretary

Michael A. Dloogatch, Membership Secretary

Greg Brim, Sergeant-at-Arms

Rich Crowley, Member-at-Large

Jon "Iggy" Ihrig, Member-at-Large

Linda Malawy, Member-at-Large

Jenny Vollman, Member-at-Large

The Chicago Herpetological Society is a nonprofit organization incorporated under the laws of the state of Illinois. Its purposes are education, conservation and the advancement of herpetology. Meetings are announced in this publication, and are normally held at 7:30 P.M., the last Wednesday of each month.

Membership in the CHS includes a subscription to the monthly *Bulletin*. Annual dues are: Individual Membership, \$22.00; Family Membership, \$25.00; Sustaining Membership, \$50.00; Contributing Membership, \$100.00; Institutional Membership, \$38.00. Remittance must be made in U.S. funds. Subscribers outside the U.S. must add \$12.00 for postage. Send membership dues or address changes to: Chicago Herpetological Society, Membership Secretary, 2060 N. Clark Street, Chicago, IL 60614. Publications are sent to U.S. members via third class bulk mail; the post office does not forward such mail, even if a special request is made to forward magazines.

Manuscripts published in the *Bulletin of the Chicago Herpetological Society* are not peer reviewed. Manuscripts should be submitted, if possible, on IBM PC-compatible or Macintosh format diskettes. Alternatively, manuscripts may be submitted in duplicate, typewritten and double spaced. Manuscripts and letters concerning editorial business should be sent to: Chicago Herpetological Society, Publications Secretary, 2060 N. Clark Street, Chicago, IL 60614. **Back issues** are limited but are available from the Publications Secretary for \$2.50 per issue postpaid. **Visit the CHS home page at** <<http://www.Chicagoherp.org>>.

The BULLETIN of the Chicago Herpetological Society (ISSN 0009-3564) is published monthly by the Chicago Herpetological Society. Copyright © 2000.

Comparison of Growth, Behavior, Parasites and Oral Bacteria of Brazos Water Snakes, *Nerodia harteri harteri*, Raised in an Outdoor Enclosure with Related Specimens Raised Indoors

John Rossi, DVM, and Roxanne Rossi
2641 Park Street
Jacksonville, FL 32204

Abstract

We compared the size, weight, behavior, parasites and oral bacteria of 41 related neonate *Nerodia harteri harteri* housed in two different environments. The group kept in a large outdoor enclosure was significantly heavier and longer, and demonstrated significant differences in behavior when compared to snakes maintained indoors in aquariums. Parasites and oral bacteria isolated from the two groups were also measurably different.

Those snakes outside averaged 33% longer and three times the mass of siblings housed in aquariums after ten months. They also demonstrated a greater flight response distance and vertical approach response distance than those siblings housed indoors. There was also a significant difference in the distance at which the snakes “froze” (became immobile) when approached. Those snakes housed outside were also more aggressive: they were four times more likely to bite when picked up. Oral bacteria from those snakes housed indoors were dominated by *Pseudomonas*, *Klebsiella* and *Enterobacter* spp., while those housed in the outdoor enclosure cultured positive for *Aeromonas* sp., *Flavomonas* sp. and diphtheroids among others.

Entamoeba sp. cysts and trophozoites were present in more snakes and more numerous per high power field in those snakes housed inside than in those housed outside. However, rhabditiform larvae, probably *Strongyloides* sp., were more frequently observed and more numerous in outdoor snakes than indoor snakes. Both groups were equally infected with subcutaneous filarid worms.

Theories for the size differences observed include increased food availability and thermoregulatory options for those snakes housed outside compared with those snakes housed inside.

A preliminary study performed with limited numbers of these snakes strongly suggests that those snakes in the outdoor enclosure were growing at a similar rate to wild members of the same species, as well as the congeneric *N. erythrogaster transversa* found along the Brazos River. This may have implications for the production of snakes to be utilized in release programs, and demonstrates the growth and reproductive potential of snakes housed in an outdoor enclosure.

Introduction

In the last five years herpetologists have shown an interest in the survival or lack thereof of repatriated reptiles after they have been in captivity for any length of time. The general consensus at this time, based upon the numerous papers presented at the International Herpetological Symposium in Cincinnati, Ohio, in 1998, was that captive snakes were not similar to wild snakes in terms of behavior or survivability. This included both those animals that were wild at one time, as well as those born in captivity. Hence, the potential conservation value of captive snakes was questioned. The reasons for low survival are unknown, but poor conditioning, and lack of familiarity with the release area are considered likely. Compared with the already low survival rates of neonates, the apparent survivability of released neonates is apparently even worse.

In all other orders of reptiles, including chelonians and crocodilians, outdoor pens are commonly used for captive maintenance. Even the closely related lizards are commonly maintained in outdoor pens. These pens appear to have nu-

merous empirical benefits, though these have not been tested or quantified. We decided to test the hypothesis that snakes raised in an outdoor enclosure were measurably different, in terms of size, weight, behavior, parasitologically and bacteriologically from those raised indoors. Furthermore, we wanted to test the second hypothesis that those snakes raised in an outdoor enclosure were more similar to wild snakes of the same age than those raised inside. Ultimately, we wanted to compare the survival of those snakes raised in an outdoor enclosure with those raised inside when they were released in exactly the same location their parents were from. Essentially, we wanted to test the value of an outdoor enclosure to produce animals that may be “closer” to wild animals than “domestic” animals.

Unfortunately, it was impossible to control every variable in this study. We could not control the temperature, humidity, or predators in the open pen, or even the amount of food consumed by individuals in the pen. Therefore, this experiment has built-in flaws, which make it unacceptable in the strict scientific sense. Nevertheless, the concept of placing a large number of siblings in two such environments is intriguing, and

it represents a major pilot study. Fine tuning of this study may be necessary before any conclusions will be made by the scientific community. From a herpetocultural standpoint however, the sum of variables observed in the outdoor pen appears to produce different animals from those produced by the sum of variables observed in the indoor cages, and the evidence is mounting that these animals are much closer to wild snakes than their caged siblings.

Materials and methods

To compare snakes undergoing these two treatments, we decided to use siblings of the same species. Forty-one neonate Brazos water snakes, *Nerodia h. harteri*, were measured and weighed, then divided into two groups. All members of the first group were placed in a large outdoor enclosure; the size and contents of which are discussed below. This group consisted of 10 males from litter 1 and 12 females from litter 2. The second group, placed in 4 indoor aquariums, consisted of 11 females from litter 1 and 4 males from litter 2, as well as 2 males from litter 1 and 2 females from litter 2. The reason for this division was to preserve genetic diversity in the outdoor pen by eliminating sibling breeding later on. All animals were placed in their respective enclosures on the same day.

Indoor snakes were housed in an insulated building with thermostatically controlled temperatures. Ambient temperature in the building was allowed to fluctuate, but rarely rose above 27°C or dropped below 22°C through the spring, summer and fall. From 1 November until 1 March, these snakes were exposed to a constant ambient temperature of 15°C, with no ventral heat and no additional light aside from natural light from a small window in the opposite end of the building. As mentioned above, they were placed in four 10-gallon aquariums. They were provided with ventral heat, such that one area of the cage was a constant 32°C. They were provided with a plastic water bowl and hide box, as well as several climbing branches. During the fall, spring and summer, light (and some heat) was provided from above in the form of an incandescent bulb. The substrate utilized was green indoor/outdoor carpet. Fish (minnows) were placed in the aquariums once or twice weekly, except during hibernation, such that all snakes fed ad libitum when food was available. The snakes were not handled except as necessary to clean the cage thoroughly.

The outdoor enclosure was constructed of pressure-treated plywood, with approximately 1 m above the ground and 15 cm below the surface. Gravel was placed on both sides of the wood in the trench dug for the wood's placement. The gravel was then covered with soil. The pen measured 9.75 m long by 7.3 m in width. The pen was reinforced by placing 1 × 8 inch wood pieces along its top to form a 10 cm lip on the inside of the pen. Additional pieces were added to each corner. The purpose of this was to aid in preventing escape.

The interior of the pen was planted with plants native to the southeastern U.S. The dominant plants in the pen were wax myrtles and black willows, although a number of sweetgum and red maple saplings began to grow in the pen by the end of the study. One each of Florida leucothoe, viburnum and *Nandina* were planted in the pen. Mimosa plants were also present.

Confederate jasmine and Virginia creeper were two common vines present in the pen. Numerous grasses including crab grass and herbaceous weeds such as hawkweed, dog fennel, sunflowers, ironweed, thistle, and primrose willow occurred naturally in the area and were common in the pen. Southern lady ferns and cinnamon ferns were also present in some areas of the pen.

Large numbers of rocks were placed in the pen along an artificial stream, and an artificial rock face with a southern and western exposure was created. This rock face incorporated three plastic boxes, approximately 36 cm long by 25 cm wide by 25 cm high, to provide hibernation areas for the snakes. Some rocks were also distributed on the ground throughout the pen. Several large hollow stumps, dead branches, and driftwood pieces were placed to provide hiding and basking areas. An artificial rock outcrop with a waterfall approximately 1 m in height (composed of fiberglass), and a basin volume of approximately 1 m³ was incorporated into an artificial stream with a pond at the opposite end. The stream and pond were created using plastic sheeting and commercial pond liner respectively, and were lined with rocks. Areas of contact were covered with concrete. A pump rated at 1200 gallons per hour was placed in the pond and recycled the water through a buried hose to the waterfall, which then flowed back downstream into the pond. A biological filter pump was also placed in the pond. The pond volume was approximately 1 m³. All electrical cords were buried and run to a nearby outlet located outside of the pen.

The stream was regularly stocked with minnows and shiners purchased at the local bait shop. Mosquito fish, *Gambusia* sp., were also stocked, but began to reproduce in sufficient quantities to maintain themselves. Crayfish, dragonfly larvae, and aquatic snails were also added to the water along with aquatic vegetation from a local waterway. Other vertebrates added to the outdoor pen included a variety of amphibians and reptiles. Amphibians included southern toads, *Bufo terrestris*, bullfrog tadpoles, *Rana catesbeiana*, and squirrel treefrogs, *Hyla squirella*. Greenhouse frogs, *Eleutherodactylus planirostris*, an introduced species, occurred naturally in the pen. Reptiles included lizards and snakes. Many lizards naturally occupied the pen during its construction, including ground skinks, *Scincella lateralis*, five-lined skinks, *Eumeces fasciatus*, and the two locally occurring anoles, *Anolis carolinensis* and the introduced *A. sagrei*. Two eastern fence lizards, *Sceloporus undulatus*, were added to the pen. An introduced species of lizard, the Mediterranean gecko, *Hemidactylus turcicus*, also invaded the pen. Snakes released in the pen included one adult male Brazos water snake (the father of the neonates), two adult female Brazos water snakes (the mothers of the neonates), two adult queen snakes, *Regina septemvittata*, and 12 of the neonates born to the female, two western ribbon snakes, *Thamnophis proximus*, two eastern fox snakes, *Elaphe vulpina*, one gray rat snake, *E. obsoleta spiloides*, six rough green snakes, *Opheodrys aestivus*, one adult Florida brown snake, *Storeria dekayi victa*, and 14 of her neonates. Other animals that were observed in the pen during the course of this study included squirrels, opossums, house cats, grackles, starlings, blue jays, robins, mockingbirds, Carolina wrens, warblers, cedar waxwings, and mourning doves. Known predators of snakes in-

cluded house cats, opossums and grackles, but some of the other animals listed may have also preyed upon snakes, since the pen was open and easily accessible during the first year of this study. Partially eaten remnants of snakes were found after cats had been frequenting the pen, and one was found in the next-door neighbor's birdbath, after a grackle had been observed in the pen. Several of the snakes were observed with stub tails and scars suggesting predation attempts had occurred.

No artificial heating or cooling devices were utilized and the snakes were exposed to those temperatures naturally occurring in the Jacksonville, Florida, area. There was no cover; hence the pen was exposed to all precipitation in this area as well. Flooding of the pen occurred three times during the study period, but only lasted for several days. The rock faces and stumps were never submerged, even during the period of maximal flooding. The snakes remained in this enclosure for the entire period of the study, including over the winter, through several freezes. They were not handled at all until the time they were measured, weighed, marked and cultured on 6 June 1999.

The snakes were placed in their respective enclosures on 24 August 1998. They were gathered during the first week in June. On 6 June 1999, the snakes were weighed and measured, and several had oral cultures performed. These snakes were also marked by branding combinations of ventral scales. This technique was useful because the small size of the neonates made scale clipping nearly impossible to perform accurately. In addition to being weighed, measured and marked, the snakes in this study were also subjected to two behavioral studies. Both flight distance and vertical approach response distance were measured in the two groups. This was accomplished in a standardized manner, by placing each snake in a 10-gallon aquarium, waiting 30 seconds, and then walking towards the aquarium and measuring the distance at which the snake responded. The responses fell into three categories: freeze distance, flight distance, and vertical approach distance. The vertical response distance was the distance at which a snake responded when approached from above by an open hand. All trials were conducted at the same ambient temperature, utilizing the same aquarium under similar lighting conditions, and the same person wearing the same clothing. The snakes were tested in random order and the results were recorded by another individual. Most snakes had been bagged for several days, and allowed to acclimate to the ambient temperature in a separate room prior to testing.

After nearly a year in the pen, the two adult females gave birth again, to a total of 44 neonates. These were also measured, weighed and marked. Some of these individuals (35) were sent back to Texas Parks and Wildlife for release at the site of origin of the adults; eight were released into the pen. One of these snakes that was released into the wild was captured alive three months later, along with two wild-born neonates of similar size. These snakes were compared with siblings of the released snakes that had been housed in the pen.

Results

Group 1 snakes maintained outdoors appeared to grow rapidly and feed regularly. Foraging behavior was observed on

many occasions and appeared to mimic that described for wild members of this species. This included "sit and wait" behavior in shallow riffle areas of the artificial stream. Snakes would position themselves in these areas by grasping rocks with their tails and keeping the anterior part of the body in the striking position. When fish would pass by in the current, the snakes would strike out and grasp them. Snakes were also observed stalking schools of fish and then darting after them. Another predatory behavior involved a lateral arching of the body with the mouth open in deep water. The tail would often chase the fish into the open mouth, whereupon they would be grasped. Other behaviors observed in the outdoor group were related to thermoregulation, with the snakes seeking cover under sun-warmed rocks during the warmer months, and basking on the surface and in bushes during the cooler months. Snakes were not observed in the water much during the late fall and winter, instead appearing to prefer the rock face and the hibernaculum areas. Thus, feeding was not observed from early November until late April.

Indoor snakes were also observed basking, but foraging was limited to grasping fish off of the carpet or in their shallow water bowls. Snakes rarely basked in the open, instead choosing to hide under objects in warm or cool areas in their cage.

Only 14 of 22 snakes released in the outdoor pen were captured 10 months later, suggesting a survival rate of 63.6%. It is possible, although unlikely, that some may have escaped detection, however, so the survival rate may have been higher. Eighteen of 19 snakes housed indoors survived this same period; one died accidentally when a water bowl fell on it. This is a survival rate of 94.7% (see Figure 1).

The snakes housed outdoors ranged in snout-vent length (SVL) from 27.3 to 36.8 cm with a mean of 31.8 cm ($n = 14$). The weights of these animals ranged from 16 to 39 g with a mean weight of 23.5 g. Group 2 snakes raised inside measured 19.1–25.4 cm SVL with a mean of 22.7 cm ($n = 18$). Their weights ranged from 5 to 10 g with a mean of 7.4 g. These differences were statistically significant ($P < .001$) using the Student's t test (see Figure 2 and Appendix 1). Differences in

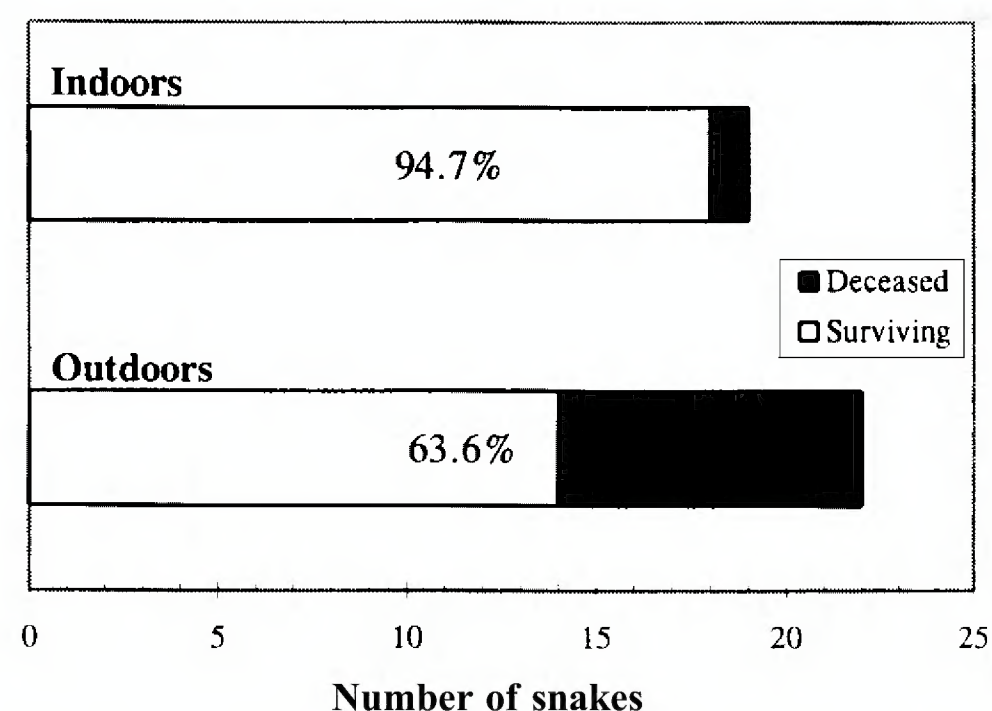
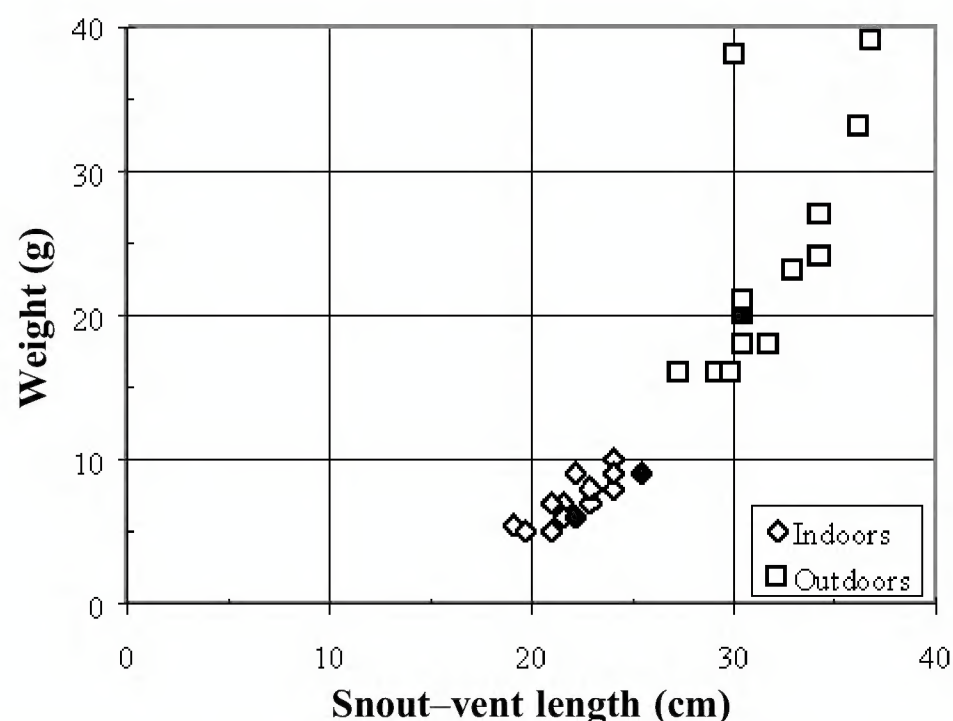


Figure 1. Survival of captive-born Brazos water snakes, *Nerodia h. harteri*, at 10 months of age.



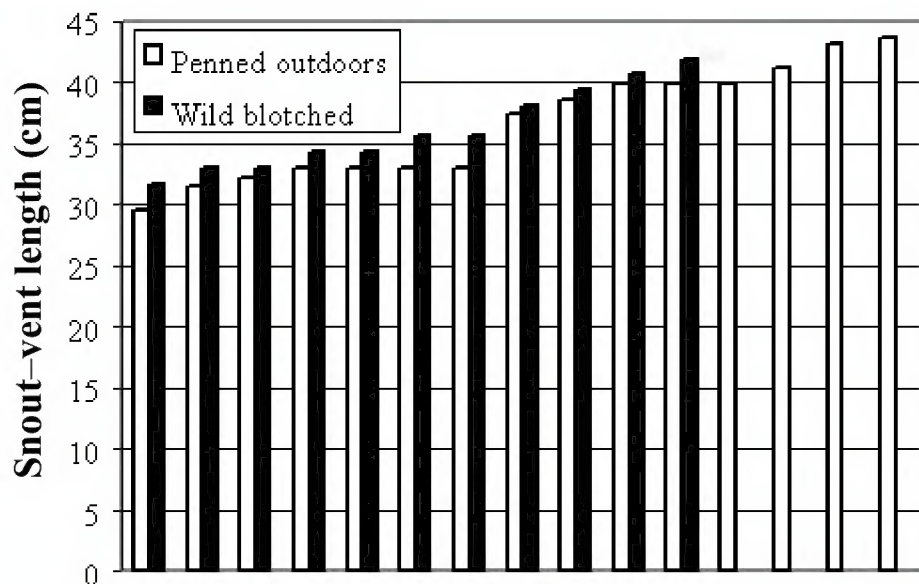


Figure 6. Snout-vent lengths of 15 pen-raised Brazos water snakes, *Nerodia h. harteri*, and 11 wild blotched water snakes, *N. erythrogaster transversa*. All snakes were roughly one year old. The wild snakes were measured in mid-July. The penned snakes were measured in early June and their lengths were extrapolated to mid-July values as described in the text.

group showed a flight distance of less than 0.15 m, and five others showed a flight distance of 0.3 m.

In addition to the behavioral differences noted above, those snakes maintained outside were more aggressive. Eleven out of 14 snakes outside bit the handler upon capture, while only four out of 18 inside did so (see Figure 5).

Oral cultures on snakes chosen at random revealed largely different sets of bacteria with little overlap between the two groups. Bacterial cultures from group 1 snakes demonstrated *Aeromonas hydrophila*, *Flavomonas* sp., *Stenotrophomonas maltophilia*, *Acinetobacter lwoffii*, *Bacillus* sp., and diphtheroids. Snakes from group 2 were cultured positive for *Pseudomonas* sp., *Citrobacter* sp., *Klebsiella* sp., *Enterobacter* sp., *Moraxella* sp., *Staphylococcus* sp., *Streptococcus* sp., and *Proteus* sp. The clinical significance of these oral bacteria is unknown. All animals in this study appeared healthy. It was simply used in this study as another method for comparison. Interestingly, over 90% of all wild water snakes from the Brazos River, (three species, including *N. harteri harteri*) cultured by the authors grew out pure *Aeromonas* sp.

Parasites were also studied in both groups of snakes. A physical exam often revealed subcutaneous swellings, which were then incised to reveal the type of parasite present. In all cases in both group 1 and group 2, these were identified as filarid worms, but the species was unknown. They occurred with equal frequency on both groups of snakes (n = 3). Fecal exams revealed other parasites or possible parasites. These included *Strongyloides* sp. eggs and larvae as well as *Entamoeba* sp. cysts and trophozoites. It is interesting to note that the snakes in group 1 had higher numbers of *Strongyloides* than group 2 snakes, yet were longer and heavier animals. However, the snakes in group 1 had lower numbers of *Entamoeba* than group 2 snakes. Although members of this amoeba group have been associated with gastroenteritis in many animals, including snakes, none of the snakes in this study appeared to have been affected by their presence. Perhaps in water snakes, like in many turtles, these organisms are commensals, not pathogens.

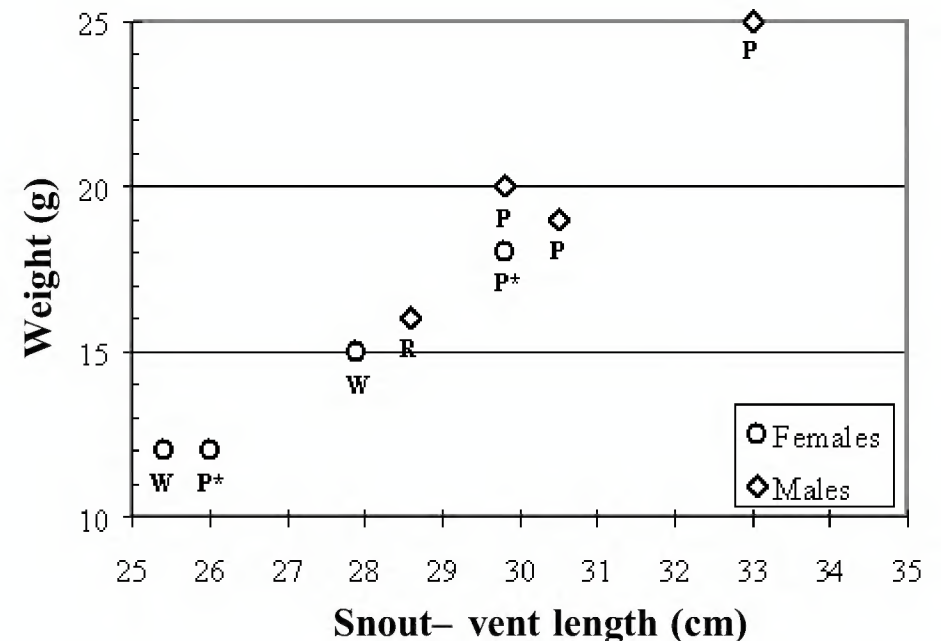


Figure 7. Snout-vent length versus weight of 3-month-old Brazos water snakes, *Nerodia h. harteri*. P = penned; R = released into wild; W = wild; * = siblings of R.

In an effort to determine the similarity of the two groups to wild snakes of the same age, we visited the Brazos River in central Texas several times throughout 1999, searching the exact site of the parent's origin. Surprisingly, we were unable to locate any of these snakes in the size/age range of those in our study (Rossi and Rossi, 1999). However, we did locate a large number of blotched water snakes, *Nerodia erythrogaster transversa*, in the same area where we once found only Brazos water snakes. Five of these snakes regurgitated relatively undigested fish, which would also suggest that they are foraging in this habitat as well. These snakes were collected, measured, weighed and had oral cultures performed. Based upon the size of the individuals collected, they could be assigned into probable age ranges. The snakes from both groups were then compared with these animals to determine which group was more similar in size, weight and oral cultures to wild blotched water snakes in the same age range, in the habitat where both species might normally be found. In order to more accurately compare the sizes of the wild blotched water snakes measured in mid-July with the penned Brazos water snakes measured in early June, we calculated their growth rate and extrapolated to a mid-July size. Based upon measurements made in August, these Brazos water snakes demonstrated a growth rate of 4.6 cm per month and were adding an average of 14.5 grams per month. The results are summarized in Figure 6. It is clear from this figure that the outside snakes were much closer in terms of size and weight to the similar aged wild blotched water snakes than those raised inside.

In a further comparison of the growth, we released siblings of the animals from both groups back into the wild with the cooperation of Texas Parks and Wildlife. These snakes were born the year after those in the initial study groups. Other members of these clutches were released into the outdoor enclosure. Three months later, we attempted to collect, weigh and measure neonates from both groups. Only one of the snakes released into the wild was recaptured at that time, and six released into the pen were recaptured.

Interestingly, two wild neonates were collected at the same

time. The sizes of these animals are compared in Figure 7. All of these 3-month-olds and the two wild neonates of unknown age are similar in size, providing further evidence that those in the outdoor enclosure may be more similar in size to “wild” snakes of approximately the same age than those maintained inside. Since this writing, seven other released neonates have been found. Those data will be incorporated into a future article. Sadly these marked snakes have been the only Brazos water snakes found at the study site since their release. The population at the site had been eliminated for two years prior to the release of these captive-born animals—offspring of four animals taken from this site as juveniles eight years ago.

Discussion

From the results presented above, it appears that there is a significant difference in terms of size, behavior, parasites and oral bacteria between the snakes maintained outside and those maintained inside. The cause or causes of the difference remains arguable however. Possible explanations for increased growth include increased thermoregulatory choices or increased food availability for the outside group. Certainly, those snakes outside could bask in full strength sunlight on rocks with a southern exposure, while those inside were limited to only the heat that was provided by a heating pad and incandescent bulb over the cage. Indeed, those snakes outside could hunt *ad libitum* every day, while those inside were only offered food once or twice weekly. Hibernation differences were also considered a possibility for some of the size differences observed. Certainly, those snakes inside were exposed to a more consistent temperature regime for a set period of time, while those outside were exposed to more temperature fluctuations and extremes on both ends of the thermal spectrum. However, based upon the summer size gains demonstrated in Figure 3, hibernation differences probably account for only a small percentage of the difference between the two groups. This observation also has implications when comparing penned snakes in northern Florida with wild snakes in central Texas. While the winters tend to be more severe in central Texas, the spring, summer and early fall in both areas are similar, i.e., mild in spring and fall, hot in summer. Indeed, the U.S. Department of Agriculture has both of these areas included in the same “climate zone.” Furthermore, both wild and penned snakes appear to seek out similar microenvironments for thermoregulatory purposes, and these areas are probably not significantly different from a thermal standpoint (we have measured similar temperatures under flat rocks both in central Texas along the Brazos River and in the pen in northern Florida).

The behavioral differences were significant and very interesting. In an enclosure where predation was possible, the greater freeze, flight and vertical approach distances may have been learned. The same may be said for aggressiveness, as demonstrated by the greater tendency to bite. Other possible causes for the differences between outdoor pen snakes and those housed indoors include effects on indoor snakes; snakes inside were handled more frequently and maintained under conditions where people passed by fairly close to the front of the cages. Even though efforts were made to avoid handling and close contact, these snakes may have become somewhat

desensitized to humans. Theoretically, their reaction may have been different towards other mammals, birds, or reptiles but this was not tested. However, it would appear that the greater freeze, flight, and vertical approach distances observed in the outdoor snakes would increase the likelihood for survival if these animals were in the wild. It is possible that these responses may be rapidly acquired however, since several of the indoor snakes later released into the pen became extremely wary animals. Attempts to measure some of these values in wild snakes for comparative purposes were met with lighting and temperature differences, as well as insufficient numbers. We hope to test these behavioral responses in wild snakes in the future however.

The effect of parasites is hard to measure since two main groups of parasites or potential parasites existed, and they varied between the two groups. Strongyle worms were more common in Group 1 (outside) snakes while amoeba appeared more numerous in indoor snakes. While no signs of gastroenteritis were observed, it is possible that these parasites may have had an effect. The same may be said for the bacteria present. While some of these bacteria are potential pathogens, no external signs of disease were present. Furthermore, snakes maintained inside for long periods, increased their growth rates and often experienced shifting of the oral bacteria when placed outside, suggesting environmental factors were more important than the parasites or bacteria observed, in terms of growth.

While the evidence for a difference between the two groups is strong, the authors can only suggest that the snakes raised outdoors are closer to wild Brazos water snakes in terms of size, weight, behavior, and bacterial fauna. At this time we are still collecting and analyzing data for comparison and statistical analysis. However, based upon the similarity in size and weight of the 1-year-old Brazos water snakes raised outdoors in the pen with the wild blotched water snakes of roughly the same age, we can infer that the outdoor pen appears to produce snakes more similar in size to those occurring in the wild. Indeed, there is reason to believe that these snakes would grow at a similar rate to their closest competitors. Certainly, the comparison of the 3-month-olds provided some evidence for similar growth rates of wild and penned Brazos water snakes. It is impossible at this time to make any other inferences about the benefits of an outdoor enclosure. That is, the production of snakes similar in size and weight to wild snakes does not mean that they *are* wild snakes, or that they are capable of surviving in the wild. Only when this is tested can this be stated. Furthermore, even if these animals survive in the wild, there must be some evidence that they have superior survival chances over captive-born neonates in order to justify the head-starting process and the utilization of the outdoor pen as a “head-starting” instrument. We have started to test this hypothesis this year with the release into the wild of five indoor-raised 1-year-olds and five outdoor-raised 1-year-olds, as well as 35 neonates, and have begun gathering data on the survivors. It should be noted however, that the outdoor pen appears to be an ideal instrument for maintaining and breeding large numbers of “difficult to maintain” species, and one pen of these dimensions appears to have the potential with Brazos water snakes to produce thousands of neonates for release over the next several years. Should re-

stocking become necessary for some snake species, the outdoor pen may represent a powerful tool for conservation.

Acknowledgments

The authors would like to thank Jim Dixon, John Werler,

and Andy Price for their advice; Dr. and Mrs. Tad Jarret of the Brazos Animal Hospital in Mineral Wells, Texas, for allowing us to use their lab for culture submission and fecal exams; and the Texas Parks and Wildlife Commission for granting us a permit to conduct this research.

References

Rossi, J., and R. Rossi. 1999. A population survey of the Brazos water snake, *Nerodia harteri harteri*, and other water snakes on the Brazos River, Texas, with notes on a captive breeding and release program. Bull. Chicago Herp. Soc. 34(11):251-253.

Sokal, R. R., and F. J. Rohlf. 1969. Biometry: The principles and practice of statistics in biological research. San Francisco: W. H. Freeman and Company.

Strimple, P. 1998. Program and Abstracts of the 22nd Annual Meeting of the International Herpetological Symposium. Cincinnati, Ohio. June, 1998.

Appendix 1. Snout–vent length (cm) and weight (g) of 10-month-old Brazos water snakes, *Nerodia h. harteri*, housed indoors and outdoors with values for Student’s *t* test comparisons of the two groups. # = females from litter 2 (same sex littermates of those housed outdoors); + = males from litter 1 (same sex littermates of those housed outdoors).

Group 1 (raised outdoors)		
Sex	Weight	Snout–vent length
♀	39	36.8
♀	20	30.5
♂	20	30.5
♀	18	31.8
♀	24	34.3
♀	18	30.5
♂	16	29.2
♂	38	30.1
♀	33	36.2
♀	16	27.3
♀	23	33.0
♂	16	29.9
♀	21	30.5
♀	27	34.3
n = 14		
$\bar{x}_{\text{weight}} = 23.5 \pm 7.9 \text{ S.D.}$		
$\bar{x}_{\text{SVL}} = 31.78 \pm 2.75 \text{ S.D.}$		

Snout–vent length (all animals)
 $H_0: \mu_1 = \mu_2 \quad H_1: \mu_1 \neq \mu_2$
 $t_{.001[30]} = 3.646; t_s = 11.18$; therefore H_0 is rejected ($P \ll .001$)

Snout–vent length (same litter males only)
 $H_0: \mu_1 = \mu_2 \quad H_1: \mu_1 \neq \mu_2$
 $t_{.001[4]} = 8.610; t_s = 10.35$; therefore H_0 is rejected ($P < .001$)

Snout–vent length (same litter females only)
 $H_0: \mu_1 = \mu_2 \quad H_1: \mu_1 \neq \mu_2$
 $t_{.001[10]} = 4.587; t_s = 5.01$; therefore H_0 is rejected ($P < .001$)

Weight (all animals) (note: the Group 1 and Group 2 variances are assumed unequal; see Sokal and Rohlf [1969: Box 13.3])
 $H_0: \mu_1 = \mu_2 \quad H_1: \mu_1 \neq \mu_2$
 $t'_{.001} = 4.213; t'_s = 7.49$; therefore H_0 is rejected ($P < .001$)

Group 2 (raised indoors)		
Sex	Weight	Snout–vent length
♀	9	25.4
♀	9	25.4
♀	7	21.6
♀	9	25.4
♀	8	22.9
♀	8	24.1
♀	10	24.1
♀	7	22.9
♀	6	21.6
♀	8	22.9
♀	5	21.0
♂	5.5	19.1
♂	9	24.1
♂	9	22.2
♀#	7	21.0
♀#	6	22.2
♂+	6	22.2
♂+	5	19.7
n = 18		
$\bar{x}_{\text{weight}} = 7.4 \pm 1.6 \text{ S.D.}$		
$\bar{x}_{\text{SVL}} = 22.66 \pm 1.86 \text{ S.D.}$		

Appendix 2. Freeze, flight and vertical approach distances for 10-month-old Brazos water snakes, *Nerodia h. harteri*, housed indoors and outdoors with values for Student’s *t* test comparisons of the two groups. Freeze and flight distances are in meters; vertical approach distances are in centimeters. ? = observer unable to determine exact response distance.

Group 1 (raised outdoors)			Group 2 (raised indoors)		
Freeze	Flight	Vertical approach	Freeze	Flight	Vertical approach
2.44	0.31	22.9	2.29	0.10	12.7
2.29	2.29	15.2	2.44	0.31	30.5
2.14	2.14	35.6	2.29	0.15	35.6
2.14	0.92	7.6	2.29	1.22	12.7
2.29	1.83	40.6	0.92	0.00	30.5
2.29	0.92	40.6	2.29	1.83	40.6
2.44	2.29	15.2	2.14	1.22	15.2
?	0.61	?	1.22	0.00	12.7
2.44	0.92	30.5	2.29	0.92	30.5
2.29	1.83	22.9	2.44	0.31	22.9
2.44	0.31	35.6	1.98	0.31	30.5
1.83	0.61	30.5	2.14	1.22	5.1
2.29	?	45.7	1.83	0.31	15.2
n = 12, 12, 12 $\bar{x}_{\text{freeze}} = 2.28 \pm 0.18 \text{ S.D.}$ $\bar{x}_{\text{flight}} = 1.25 \pm 0.77 \text{ S.D.}$ $\bar{x}_{\text{vertical}} = 28.6 \pm 11.9 \text{ S.D.}$			n = 18, 18, 18 $\bar{x}_{\text{freeze}} = 2.04 \pm 0.42 \text{ S.D.}$ $\bar{x}_{\text{flight}} = 0.51 \pm 0.56 \text{ S.D.}$ $\bar{x}_{\text{vertical}} = 19.9 \pm 13.0 \text{ S.D.}$		

Freeze distance
 $H_0: \mu_1 = \mu_2 \quad H_1: \mu_1 > \mu_2$
 $t_{.05[28]} = 1.701; t_s = 1.85$; therefore H_0 is rejected ($P < .05$)

Flight distance
 $H_0: \mu_1 = \mu_2 \quad H_1: \mu_1 > \mu_2$
 $t_{.005[28]} = 2.763; t_s = 3.04$; therefore H_0 is rejected ($P < .005$)

Vertical approach distance
 $H_0: \mu_1 = \mu_2 \quad H_1: \mu_1 > \mu_2$
 $t_{.05[28]} = 1.701; t_s = 1.85$; therefore H_0 is rejected ($P < .05$)

Additional Notes on Native and Non-native Turtles of the Rio Grande Drainage Basin, New Mexico

James N. Stuart¹

Abstract

I provide observations on the status and natural history of ten species or subspecies of aquatic and terrestrial turtles, all of which have been detected within the Rio Grande Valley and tributaries in New Mexico. Five of these are native to the drainage basin (*Kinosternon flavescens*, *Chrysemys picta bellii*, *Trachemys gaigeae*, *Trionyx spiniferus emoryi*, and *Terrapene ornata luteola*), one is either native or established (*Chelydra serpentina*), one is introduced and established (*Trachemys scripta elegans*), and three are introduced and apparently not established (*Chrysemys picta marginata*, *Terrapene carolina*, and *Trachemys s. scripta*). Specimens of non-native *Terrapene o. ornata* are also found in the study area; their interaction with native *T. o. luteola* is unclear. Previously published information on native and non-native species in the river basin is also reviewed. The number of introduced taxa reflects the proximity of surveyed areas to urban locations and the prevalence of some species in the pet trade.

Introduction

The native turtle fauna of the Rio Grande drainage basin in New Mexico is known to consist of at least five species (Degenhardt et al., 1996). Prior to the comprehensive study by Degenhardt et al. (1996), several other publications discussed this turtle fauna (Degenhardt and Christiansen, 1974; Hink and Ohmart, 1984; Stuart, 1995). However, much remains unknown about these primarily aquatic species and their status and persistence in a xeric environment. In this article I provide natural history notes and observations on native and non-native (introduced) species of turtles that have been encountered in the Rio Grande Valley and its adjacent environments.

Description of Study Area

The Rio Grande is a south-flowing river that arises in southern Colorado and bisects the state of New Mexico; south of New Mexico it forms the U.S.–Mexico border and eventually drains into the Gulf of Mexico. The New Mexico reach of the river traverses ca. 720 km between the elevations of 2288 and 1220 m, and drains an area of ca. 63,500 km². Primary tributaries in the state include the Jemez River, the Rio Chama, and the Rio San Jose/Rio Puerco drainage system. For turtles in the Rio Grande drainage basin, the most important areas of occurrence are the Middle Rio Grande Valley, from Cochiti Reservoir south to Bosque del Apache National Wildlife Refuge; and the Southern Rio Grande Valley, from near the head of Elephant Butte Reservoir south to the Texas border. The Pecos River, although a tributary of the Rio Grande in Texas, is not considered part of the Rio Grande drainage basin within New Mexico.

The riparian forest in much of the Rio Grande Valley of New Mexico consists of native Rio Grande cottonwood (*Populus deltoides* var. *fremontii*), Goodding willow (*Salix gooddingii*), coyote willow (*S. exigua*), seepwillow (*Baccharis glutinosus*) and an ever-increasing complement of non-native plants, including Russian olive (*Elaeagnus angustifolia*), salt cedar (*Tamarix* spp.), and Siberian elm (*Ulmus pumila*).

Flood control projects in the valley have eliminated many of the natural ponds and marshes which once occurred in the floodplain, and almost all surface water now is confined to the shallow river channel or in riverside canals. In a few locations, past sand-and-gravel mining in the river floodplain has produced deepwater ponds used by aquatic turtles.

Two localities are referenced frequently in this article. The Rio Grande Nature Center State Park (RGNC) is a wildlife preserve and public recreational and education facility located within the city of Albuquerque, Bernalillo County. The RGNC was created in 1980 and since that time has become a popular viewing spot for aquatic turtles and many bird species (Seidel, 1984). The RGNC encompasses ca. 109 ha within the historic floodplain of the Rio Grande in central Albuquerque (1514 m elevation). Within the area managed by the RGNC, 40 ha are agricultural fields farmed to provide wildlife forage, and another 40 are riparian forest accessible by foot paths. The central area of the RGNC covers about 28 ha and was the primary survey area in this study; included in this area is a visitor center and headquarters building and three artificial ponds partially surrounded by riparian forest. A well-developed residential area adjoins the state park.

A major feature of the RGNC is its artificial ponds, which were created to replicate the natural ponds and marshes that were once common in the floodplain. Main Pond, located adjacent to the RGNC visitor center, was constructed as a 0.8 ha viewing pond in 1980 and was expanded to 2.8 ha in 1982. North Pond (0.1 ha), located 60 m north of the Main Pond, was constructed in about 1987. In spring 1995, the RGNC constructed a third pond, Discovery Pond (ca. 1 ha), located 275 m south of Main Pond. All three ponds provide habitat for a variety of native and non-native species, including amphibians, reptiles, and many waterfowl. The three ponds at the RGNC are located within 50 m of a riverside canal and ca. 400 m from the river channel.

The second locality, Bosque del Apache National Wildlife Refuge (BDANWR), was created in 1939 as a wildlife habitat

1. Museum of Southwestern Biology, University of New Mexico, Albuquerque, NM 87131; and New Mexico Department of Game and Fish, Santa Fe, NM 87504-5112 (mailing address). E-mail: JStuart@state.nm.us

area and is located 13 km south of San Antonio, Socorro County. The refuge straddles the Rio Grande Valley and includes a variety of terrestrial habitats ranging from cotton-wood–willow riparian vegetation to Chihuahuan Desert grass-land and scrubland. Of the refuge’s more than 23,000 ha, more than 5,000 ha are seasonally-flooded marshes vegetated by cattails (*Typha* sp.) and bulrush (*Scirpus* sp.) and typically under 1 m deep; perennial ponds (1–2 m deep); and wet mead-ows. These wetland habitats, which support numerous water-fowl and other wildlife species, are primarily maintained by a system of canals, water-diversion structures, and levees that allows substantial control of surface water and replicates the seasonal cycle of flooding and draw-down that historically shaped the Rio Grande Valley ecosystem.

Materials and Methods

Surveys of turtles in the Rio Grande drainage basin were conducted during 1994–98, with emphasis on mark–recapture studies of sliders (*Trachemys* sp.) at BDANWR and RGNC (Stuart, 1998b). Aquatic turtles were trapped in ponds, marshes, and slow ditches using nylon-mesh hoop traps baited with canned sardines and placed in shallow (< 70 cm deep) open water. Traps were checked twice daily for a period of 3–5 days. Aquatic turtles also were taken occasionally by hand or dipnet in clear water. Box turtles and the occasional aquatic

turtle were collected on land. Where trapping or other forms of capture could not be used, basking and swimming turtles were observed and identified with binoculars. Reliable obser-vations by other field researchers and land management per-sonnel working in the study area were also recorded.

Captured turtles were typically measured, uniquely marked (by notching the carapacial marginals), and released within a day of capture. Straight-line lengths of the carapace (CL) and plastron (PL) were measured at the midline of the shell in all specimens. Because of study objectives and restrictions against removal of turtles from certain capture sites, most captured specimens that were non-native were released at the capture site. However, occasional specimens were preserved as vouchers and are deposited in the University of New Mexi-co Museum of Southwestern Biology (MSB). These specimens are identified by MSB catalogue number or as “accessioned” if not yet catalogued.

I use the terms “introduced” or “non-native” for any taxon (species or subspecies) found at a locality in the Rio Grande basin where it does not naturally occur. Most introductions are captive animals, often obtained through the commercial pet trade, which have been purposefully or accidentally released. An introduced species or subspecies is considered “estab-lished” when it is known to be successfully reproducing in a new locality. In the Discussion section and in Table 1, I use

Table 1. Species and subspecies of turtles that have been detected in the Rio Grande drainage system of New Mexico. Definitions of status (Native, Established, Introduced and Native Transplant) are provided in the text. A question mark indicates status is uncertain.

Species / Subspecies	Status in Drainage				References*
	Native	Established	Introduced	Native Transplant	
<i>Chelydra serpentina serpentina</i>	X?	X?			1, 2, 4
<i>Kinosternon flavescens flavescens</i>	X			X	1, 4
<i>Chrysemys picta bellii</i>	X				1, 2, 4
<i>Chrysemys picta marginata</i>			X		4
<i>Malayemys subtrijuga</i>			X		1
<i>Pseudemys gorzugi</i>			X		2
<i>Terrapene carolina</i> subspecies			X		1, 4
<i>Terrapene ornata luteola</i>	X			X	1, 4
<i>Terrapene ornata ornata</i>			X		4
<i>Trachemys gaigeae</i>	X			X	1, 2, 3, 4
<i>Trachemys scripta elegans</i>		X			1, 2, 3, 4
<i>Trachemys scripta scripta</i>			X		2, 4
<i>Trionyx spiniferus emoryi</i>	X				1, 2, 4
Totals	5 or 6	1 or 2	6	3	

* References (may not be primary source for information): 1 = Degenhardt et al., 1996; 2 = Stuart, 1995; 3 = Seidel et al., 1999; 4 = this article.

the term “native transplant” for introduced taxa that are native to a part of the Rio Grande drainage basin of New Mexico but have been detected at localities in the basin outside of their known natural range.

Species and Subspecies Accounts

Common Snapping Turtle, *Chelydra serpentina serpentina*

Chelydra serpentina has been reported from several localities in the Middle Rio Grande Valley of New Mexico where its status as a native or introduced species is unclear (Stuart, 1995; Degenhardt et al., 1996). At least eight capture records from the Albuquerque area and elsewhere along the Rio Grande suggest that this species, if not native, is now established in the river valley, although it is by no means common. A large adult male trapped at BDANWR on 10 July 1996 was the only snapping turtle captured during five years of turtle surveys at the refuge and, based on comparative photographs, may have been the same adult observed at the refuge in 1993 (see Stuart, 1995). Another adult, or possibly the same individual, was observed at BDANWR in August 1997 (M. Oldham, pers. com.).

Two adult male *C. serpentina* (designated as male #1, 348 mm CL; and male #2, 286 mm CL) were trapped, marked, and released in the Main Pond of the RGNC in August–September 1995. One of these was possibly the same individual observed in 1993 and reported by Stuart (1995).

Male–male combat has been reported in *C. serpentina* (e.g., Janzen and O’Steen, 1990; Hurlburt et al., 1999), but apparently has not been observed in New Mexico populations. On 27 June 1996 (0740 h), I observed an adult *C. serpentina* at the RGNC apparently grappling with a hoop trap set in ca. 70 cm water in the Main Pond. The turtle was more than half out of the water when first noted and seemed to be entangled in the trap mesh. Upon my approach, it quickly disengaged from the outer surface of the trap and disappeared into the turbid water. Inside the trap was a second *C. serpentina* (Male #1). Although the escaped turtle was not identified, it was almost certainly the other marked male (#2), the only other *C. serpentina* trapped at the RGNC during the study period. I interpreted this observation as an aggressive encounter between the two resident males in the pond.

Yellow Mud Turtle, *Kinosternon flavescens flavescens*

Kinosternon flavescens is native to the Southern Rio Grande Valley downstream of Caballo Dam. Degenhardt and Christiansen (1974) suggested that this turtle occurs in the Rio Grande as far north as either Caballo Reservoir or Elephant Butte Reservoir (Socorro and Sierra counties); however, no specimen records were identified from these impoundments (Degenhardt et al., 1996). More recently, two specimens have been reported from Socorro County: an adult male collected at BDANWR in 1996 (Stuart, 1997), and an adult taken near Fort Craig in the uppermost portion of Elephant Butte Reservoir in 1997 (Broderick, 2000). I believe these Socorro County specimens are potentially of natural occurrence and may represent an upstream range extension, although additional

specimens are needed to confirm the status of *K. flavescens* in this part of the valley. A female specimen (MSB 49112) collected in 1987 near Cochiti Reservoir, Sandoval County, was almost certainly an introduction (Degenhardt et al., 1996).

One or more individuals of *K. flavescens* have been observed at the RGNC since at least the early 1990s (R. Tydings, pers. com.). On 25 June 1997, two adult male *K. flavescens* (126 mm CL, 363 g; and 124 mm CL, 275 g) were trapped at the RGNC, one each in the Main and North ponds. These two individuals were recaptured in the same trap and released in Main Pond on 19 June 1998. It is likely that these two turtles were introductions; there is no evidence that the species is established at the RGNC or in the Albuquerque area.

Western Painted Turtle, *Chrysemys picta bellii*

Chrysemys p. bellii is native in the Rio Grande Valley in New Mexico where it occurs most commonly in quiet waters near or adjacent to the river channel. The ponds at the RGNC and BDANWR are ideal habitat for this turtle and it is common at these sites. Western painted turtles may be less common in the Rio Grande Valley since the advent of extensive flood control and agricultural development, activities that have eliminated many of the wetlands frequented by this species. However, *C. p. bellii* can still be detected at most localities in the valley where it was found to occur during the 1960s and 1970s (Degenhardt and Christiansen, 1974; pers. obs.).

Stuart (1995) reported an observation of a *C. p. bellii* from the Rio Grande upstream of Pilar, Taos County, in 1989. This location was farther upstream in the river than the previous northernmost locality (Española, Rio Arriba County; Degenhardt et al., 1996). Since then, other observations have been made in the Rio Grande upstream of Española. A specimen was collected on a road near Dixon, Rio Arriba County, in 1997 but apparently not preserved (D. Storch, pers. com. to C. W. Painter). River rafting guides who frequently float the 8.8 km reach of the Rio Grande from Pilar downstream to the Taos–Rio Arriba county line regularly observe hard-shell turtles basking in slow-water sections of the river. Descriptions of these turtles suggest they are *C. p. bellii* (L. Saunders, pers. com.; R. Piatt, pers. com.). Voucher specimens or photographs of specimens from Taos County are apparently lacking.

Morphometric data were collected on first-time captures of *C. p. bellii* at the RGNC. Size data (mean $\pm$ standard deviation, range) for RGNC males (N = 29) were as follows: CL = 150.0 ± 14.0 , 122–174 mm; PL = 137.2 ± 11.2 , 112–157 mm; mass = 405.9 ± 101.9 , 232–573 g. For RGNC females (N = 23), these measurements were: CL = 166.4 ± 22.1 , 101–202 mm; PL = 156.1 ± 19.9 , 98–187 mm; mass = 638.5 ± 212.3 , 140–1064 g. Almost all adult males at the RGNC greater than ca. 138 mm CL had well-developed reticulate melanism (see Stuart, 1998a).

At the RGNC, this species appears to be as common or possibly somewhat less common than the non-native *Trachemys scripta elegans* based on counts of basking individuals. It is possible that the larger sliders may outcompete painted

turtles for the most desirable basking spots.

Midland Painted Turtle, *Chrysemys picta marginata*

Chrysemys picta marginata is native to the central United States and does not occur naturally in New Mexico (Conant and Collins, 1998). A single adult painted turtle that appeared to be a *C. p. marginata* was observed basking on a log in the RGNC Main Pond in spring 1998. On 19 June 1998, an adult male *C. p. marginata* (127 mm CL, 116 mm PL, 265 g) was captured and released in Main Pond. The specimen (MSB 61372) was recaptured in May 1999. There is no evidence that this introduced subspecies is established in the Albuquerque area.

Ornate Box Turtle (Western Box Turtle), *Terrapene ornata*

The status of *Terrapene ornata* in the study area is complicated by several factors. Native populations of the subspecies *T. o. luteola* (desert box turtle) have been verified to occur in the Rio Grande Valley as far north as Valencia County, at the south end of the present Albuquerque metropolitan area. Native populations of the nominate subspecies, *T. o. ornata* (ornate box turtle), are common in eastern New Mexico, and many specimens found in this region are transported to Albuquerque and other urban areas as pets (pers. obs.). Other examples of the ornate subspecies are sold in local pet stores and plant nurseries and are possibly from locations outside of New Mexico (such as Louisiana, where a thriving trade in box turtles, including *T. o. ornata*, existed until recently; Messinger and Patton, 2000). Some reproducing colonies maintained in local yards and gardens consist of turtles of both subspecies (including intergrades) and from various populations (pers. obs.).

Several resident box turtles observed at the RGNC in 1998 appeared to be of the desert subspecies (*luteola*), but at least one was a *T. o. ornata*. Most of these apparently were not initially captured at the nature center but were found in nearby residential areas and brought to the RGNC for release (R. Tydings, pers. com.).

One reason for the popularity of box turtles as yard pets is that they will feed on small individuals of the non-native brown garden snail, *Helix aspersa*, a common pest in gardens and well-watered yards in Albuquerque (pers. obs.).

Eastern Box Turtle, *Terrapene carolina*

Like *Terrapene ornata*, the non-native *T. carolina* is a popular garden pet and is commonly sold in New Mexico. At least two subspecies of *T. carolina* are occasionally found in the Albuquerque area, all specimens of which are escaped or liberated captives. Two specimens in the University of New Mexico collection (MSB 167 and 7522), both ca. 90 mm PL, are of the subspecies *T. c. triunguis* (three-toed box turtle) and were collected in Albuquerque during 1953–54. Examples of this subspecies and, less frequently, *T. c. carolina* (eastern box turtle), were available in city pet stores as recently as 1998 (pers. obs.). During summer 1995, ca. 128 individuals of *T. c. triunguis* were seized from Albuquerque pet stores by the

U.S. Fish and Wildlife Service pursuant to a criminal case against a live animal trader. The turtles were temporarily held at the Rio Grande Zoological Park in Albuquerque. The case proved unsuccessful and the turtles were returned to the pet stores and presumably sold (J. Brown, pers. com.).

One specimen of *T. c. triunguis* was apparently seen near the RGNC in 1995 (R. Forbes, pers. com.). Although there is no evidence that *T. carolina* is established in the study area, a feral population potentially could result from escaped or liberated pets, especially in mesic areas of the Rio Grande Valley.

In 1999, Louisiana enacted a law to prohibit commercial harvesting of wild *Terrapene*, including *T. c. triunguis*, in the state (Messinger and Patton, 2000). This much-needed legislation should significantly reduce the number of *T. c. triunguis* entering New Mexico via the pet trade.

Big Bend Slider (Rio Grande Slider), *Trachemys gaigeae*

Trachemys gaigeae is native to the Rio Grande in New Mexico where the northernmost population known is at BDANWR (Stuart, 1998b). A single, unconfirmed record from the late 1970s also exists for La Joya State Waterfowl Area, 50 km north of BDANWR (Stuart, 1995; Degenhardt et al., 1996).

On 15 August 1995, a sexually mature male *T. gaigeae* (140 mm CL) was trapped in North Pond at the RGNC. This specimen was almost certainly an introduction, although distinct growth rings (annuli) on its plastral scutes suggested that it probably had not been a long-term captive. No additional individuals have been detected in the Albuquerque area. The dense, submergent vegetation (mostly *Potamogeton* sp. and *Chara* sp.) in North Pond is very similar to vegetation at sites at BDANWR where *T. gaigeae* occurs (Stuart, 1998b).

Red-eared Slider, *Trachemys scripta elegans*

Trachemys scripta elegans has been widely introduced outside of its native range, a result of its popularity in the pet trade. Since the 1970s, introduced specimens of this subspecies have been encountered on several occasions within the Rio Grande Valley of New Mexico (Degenhardt and Christiansen, 1974; Stuart, 1995; Degenhardt et al., 1996). Until recently, evidence that *T. s. elegans* was established in the study area was somewhat ambiguous. Survey efforts in the Albuquerque area during 1995–98 clearly demonstrated that a viable population of at least 50 adult and subadult *T. s. elegans* exists at the RGNC and has persisted there for more than a decade. Adults were commonly observed basking at this locality, often as early as late January, and hatchling and juvenile sliders were often found in the vicinity of the RGNC ponds during the summer. A photograph of basking sliders and a painted turtle used in Conant and Collins (1998:134–135) was taken at the RGNC visitor center (D. Sias, pers. com.).

Gravid *T. s. elegans* were detected at the RGNC during the study period. On 19 June 1998, a gravid female (263 mm CL; 247 mm PL; ca. 2400 g) was captured and induced to oviposit on 23 June following injection with oxytocin. She laid 24 eggs, 20 of which measured as follows (mean $\pm$ standard

deviation, range): length = 34.1 ± 1.5 , 31.3–36.5 mm; width = 22.6 ± 0.6 , 21.3–23.6 mm; mass = 10.25 ± 0.6 , 8.7–11.1 g. An additional egg with unusual dimensions (41.8×26.3 mm, 17.5 g) did not hatch. Hatchlings ($N = 20$) emerged during 20–24 August (after 58–62 days incubation at 27–30°C) and had a CL of 31.5 ± 0.7 , 30.1–32.7 mm and mass of 6.7 ± 0.4 , 5.6–7.4 g. Voucher specimens of hatchlings are deposited in MSB (accessioned).

On 29 May 1999, a gravid female (183 mm CL; 171 mm PL; 900 g) was encountered on land near the Main Pond. She was injected with oxytocin the same day and laid 11 eggs which measured as follows: length = 31.7 ± 2.0 , 29.0–35.8 mm; width = 20.4 ± 0.8 , 19.1–21.2 mm; mass = 7.1 ± 0.30 , 7.0–8.0 g. The eggs were incubated but spoiled after a few weeks.

I have also observed basking *T. s. elegans* at the following locations within the Rio Grande Valley in the Albuquerque metropolitan area: Shady Lakes Water Lily Garden, near Alameda at the Bernalillo–Sandoval county line (six adults seen on 17 May 1997; 15 adults seen on 7 April 2000); Sandia Lakes Fishing Area, Sandia Indian Reservation, Sandoval County (five adults seen on 17 May 1997); and Isleta Lakes Fishing Area, Isleta Indian Reservation, Bernalillo County, (one adult female seen on 9 April 2000). All three of these sites consist of deepwater ponds that were created by sand-and-gravel mining operations and later developed as recreational fishing areas. The Sandia and Isleta sites receive heavy recreational use, and basking sites and aquatic vegetation are very limited. Observations of hatchling turtles by employees at Shady Lakes suggest that *T. s. elegans* may be established at this site.

In addition to captures and observations from the Rio Grande Valley near Albuquerque, two other specimens were recently trapped in the study area. A nongravid adult female *T. s. elegans* (222 mm CL; 1630 g) was taken at BDANWR in June 1997 (MSB accessioned). On 16 July 1998, a nongravid adult female (210 mm CL, 1497 g) was trapped and released in a small, spring-fed artificial pond within the Elena Gallegos Land Grant in the foothills of the Sandia Mountains, east side of Albuquerque. The latter locality is within the Rio Grande drainage basin but ca. 20 km from the Rio Grande.

It is likely that all *T. s. elegans* found in the Rio Grande Valley of New Mexico are introductions from the pet trade, or offspring of pet trade animals, and therefore are probably derived from populations in the Mississippi River drainage basin (most commercially-bred sliders are apparently from Louisiana; Warwick et al., 1990). This assumption is supported by morphological characteristics seen in specimens from the RGNC and other Rio Grande sites that are typical of Mississippi basin sliders (i.e., deep red, continuous post-ocular stripe; narrow yellow transverse bars on carapace). In contrast, native *T. s. elegans* from the Pecos River and lower Rio Grande in Texas are often conspicuously marked with broad yellow transverse bars on the carapace, and the post-ocular stripe is often discontinuous or reduced to 1 or 2 ovoid spots, similar to that of *T. gaigeae* (Seidel et al., 1999; Bartlett, 2000; pers. obs.).

Several Albuquerque pet stores sell small (ca. 10–15 cm CL) *T. s. elegans*, some of which are certainly destined for release in the Rio Grande Valley. I suspect the present rate of introduction must be much less than what occurred during the height of the commercial trade in hatchlings (prior to its ban in 1975). Recent efforts by some in the pet trade industry to rescind the U.S. Food and Drug Administration's "four-inch" minimum-size sale restriction on turtles could reverse this trend.

Yellowbelly Slider, *Trachemys scripta scripta*

This subspecies of slider is native to the southeastern United States and, although occasionally available in the pet trade, is apparently much less common in captivity than *T. s. elegans*. Some Albuquerque turtle owners keep examples of this subspecies, however, and there are probably occasional releases in the Rio Grande (pers. obs.). Stuart (1995) reported an adult male collected at BDANWR in 1994.

On 19 June 1998 a juvenile female *T. s. scripta* (119.5 mm CL) was captured in Main Pond at the RGNC. A lack of growth rings (annuli) on the plastral scutes, except for a very thin area of new growth, suggests that this specimen was probably a recently-released captive. The turtle was marked and released.

An adult *Trachemys* observed basking on 17 May 1997 at Shady Lakes Water Lily Gardens, ca. 14 river km north of the RGNC, may have been a *T. s. scripta*. *Trachemys s. elegans* also occurs at this site (see above).

Texas Spiny Softshell, *Trionyx spiniferus emoryi*

Trionyx spiniferus (= *Apalone spinifera*) is native to the Rio Grande in New Mexico, where it ranges upstream to at least Cochiti Dam, Sandoval County (Hink and Ohmart, 1984; Stuart, 1995). The species is commonly observed basking on the banks of riverside canals (such as at BDANWR and near the RGNC) and less frequently in the main channel of the Rio Grande. Urbanization and agricultural development does not seem to have negatively affected this species which readily uses man-made canals and ditches near the river and large impoundments such as Elephant Butte Reservoir. Softshells are apparently less capable than other aquatic turtles in New Mexico of terrestrial migration to escape drying waters. Their tolerance for man-made water bodies is therefore advantageous since "dewatering" of some reaches of the Rio Grande (such as between San Antonio and Elephant Butte in 1996, 1999 and 2000) has become more frequent in recent dry years and as human demands on the valley's surface water supply increase.

Almost all records of spiny softshells in the Rio Grande drainage basin are from the river valley, although Stuart (1995) observed several in the lower five kilometers of the Jemez River (a Rio Grande tributary north of Albuquerque) in 1991. A recent unconfirmed observation of *T. spiniferus* in the Rio San Jose, a Rio Grande tributary in western Valencia County, is of interest because it may represent the first report in the basin of softshells occurring a considerable distance away from the Rio Grande. In early September 1997, Stacey Carr (pers. com.) observed two basking turtles slide off the

bank of the Rio San Jose near the town of Suwanee on the Laguna Indian Reservation, Valencia County. His description of the turtles (mud-colored, with elongated snouts) strongly suggests that they were *Trionyx*. The locality is ca. 16 river km upstream of the confluence of the Rio San Jose and Rio Puerco, and an additional 80 river km upstream of where the Puerco enters the Rio Grande near Bernardo, Socorro County. The San Jose is a small but apparently perennial stream, whereas the Puerco is a severely degraded and entrenched channel that carries only intermittent flows; it is very poor habitat for any aquatic turtle. The possible presence of soft-shells (and also *C. picta bellii*; see Stuart, 1995) in the Rio San Jose may be the result of past upstream migrations when flows in the Rio Puerco were more consistent. However, the possibility of introduction cannot be discounted.

Discussion

The introduction and establishment of non-native turtles is a common occurrence in many regions, particularly in proximity to urban areas (e.g., Dancik, 1974; Hulse, 1980; Bury, 1994; Ernst et al., 1994; Livo et al., 1998). Available data from this study and previous reports indicate that the Rio Grande drainage basin in New Mexico presently supports at least five taxa of native turtles, and one taxon that is verified as established (Table 1). Six other taxa have been detected as introductions but are not known to be established; these include two species not discussed herein, the western river cooter (*Pseudemys gorzugi*) and Malayan snail-eating turtle (*Malayemys subtrijuga*). In addition, three of the native taxa have been reported as “native transplants”; that is, they are native to the drainage basin but have also been found at localities in the basin outside of their natural ranges (Table 1).

Introduced turtles can potentially impact natives in three primary ways: 1) competition with natives for limited resources; 2) introduction of non-native parasites and diseases against which natives may have little defense; and 3) interbreeding with natives, resulting in dilution or extirpation of native genetic stock. Non-native turtles can also potentially impact other species of native fauna and flora through either direct competition for resources or predation.

Evidence of competition between native and introduced turtles in the basin is not compelling. There is the potential for competition between *C. p. bellii* and *T. s. elegans* at the RGNC although trapping and observations of basking turtles do not suggest that *C. p. bellii* is declining at this site. The potential for competition between introduced *T. s. elegans* and native turtles has been noted elsewhere (Arvy and Servan, 1998). I know of no evidence that disease or parasites have been introduced to native turtles from non-natives in the Rio Grande basin.

There is evidence that interbreeding between native and introduced turtles in the Rio Grande basin has occurred and may be ongoing. Probable hybridization of *T. gaigeae* and *T. s. elegans* has been detected in the Middle Rio Grande Valley

(Stuart, 1998b; Forstner et al., 1999; Seidel et al., 1999) and is of concern because of the potential for genetic “swamping” of native sliders, a situation that has been observed within *T. scripta* (Ernst et al., 1994). For example, in Virginia, Mitchell (1994) documented extensive intergradation between native *T. s. scripta* and non-native *T. s. elegans* and suggested that pure native stocks of *T. scripta* could cease to exist in the state in the next few decades. Although *T. s. elegans* is established at Albuquerque, no breeding populations have been detected farther south in the Rio Grande of New Mexico where native *T. gaigeae* occur. It is possible that *T. gaigeae* has a competitive advantage in these southern localities, and that differences in courtship behavior between the two species (Stuart and Miyashiro, 1998) may limit the potential for hybridization where *T. s. elegans* has been introduced.

The greater Rio Grande–Pecos River drainage basin is apparently unique in being the only river system to support three different genetic stocks of *Trachemys*: 1) native *T. gaigeae* in the middle section of the mainstem Rio Grande; 2) native *T. s. elegans* in the Pecos and lower Rio Grande of Texas; and 3) non-native, established *T. s. elegans* (probably of Mississippi drainage origin) in the central New Mexico reach of the Rio Grande (and potentially elsewhere in the basin; see Bartlett, 2000). Additional efforts are needed to assess the potential long-term effects of introductions on native slider populations in this river system in New Mexico, Texas, and Mexico.

Intergradation between native and non-native subspecies of ornate box turtles (*T. ornata*) is difficult to assess. Both subspecies are commonly transported as pets and introduced outside of their natural ranges. Therefore, a *T. ornata* collected in the Albuquerque area may potentially be a native, a native transplant, an introduction, part of an established population, or the result of interbreeding of specimens from different localities. An additional complication is that the natural intergradation zone between *T. o. luteola* and *T. o. ornata* in New Mexico east of the Rio Grande is poorly understood (Degenhardt et al., 1996). It is possible that *T. ornata* populations in the urbanized parts of Rio Grande basin may eventually prove to be undiagnosable at the subspecies level due to the effect of introductions.

Acknowledgments

For providing observations and information, I thank Stacey Carr, Jennifer Brown, Rebecca Tydings, Don Sias, Richard Forbes, Carolyn Cleveland, Donna Storch, Charles Painter, Leigh Saunders, and Rick Piatt. For facilitating field studies, I thank the staff of the RGNC (Rebecca Tydings, Karen Brown, Jake McCoy, Geneva Garcia, and Rob Yaksich) and BDANWR (Phil Norton, John Taylor, and Mike Oldham). Jennifer Miyashiro, Greg Farley, Ernie Valdez, and Steve Davenport assisted in the field. Fieldwork was partially supported by grants from the Chicago Herpetological Society and the New Mexico Department of Game and Fish Share With Wildlife Program.

Literature Cited

- Arvy, C., and J. Servan. 1998. Imminent competition between *Trachemys scripta* and *Emys orbicularis* in France. Pp. 33-40. In: U. Fritz, U. Joger, R. Podloucky, and J. Servan, editors, Proceedings of the EMYS Symposium, Dresden 96. Mertensiella No. 10.
- Bartlett, D. 2000. Notes from the field. The geckos and sliders: Surprising discoveries in Texas' Big Bend. Reptiles Magazine 8(3):30, 32-35.
- Broderick, S. C. 2000. Fish and herptile communities in wetlands in the Fort Craig reach of the Rio Grande and the Elephant Butte Delta, Socorro County, New Mexico, 1997 and 1998. Unpubl. final report, U.S. Bureau of Reclamation, Denver, CO. iv + 57 pp. + appendices.
- Bury, R. B. 1994. Freshwater turtles of the Pacific Northwest: Issue of introduced species. Northwest Science 68:117 (abstract).
- Conant, R., and J. T. Collins. 1998. A field guide to reptiles and amphibians of eastern and central North America. 3rd ed., expanded. Boston: Houghton Mifflin Co.
- Dancik, T. 1974. A survey of the turtles of the Des Plaines River. Bull. Chicago Herp. Soc. 9:23-33.
- Degenhardt, W. G., and J. L. Christiansen. 1974. Distribution and habitats of turtles in New Mexico. Southwest. Nat. 19:21-46.
- Degenhardt, W. G., C. W. Painter and A. H. Price. 1996. Amphibians and reptiles of New Mexico. Albuquerque: Univ. of New Mexico Press.
- Ernst, C. H., J. E. Lovich and R. W. Barbour. 1994. Turtles of the United States and Canada. Washington, D.C.: Smithsonian Institution Press.
- Forstner, M. R. J., J. M. Forstner, J. R. Dixon and S. K. Davis. 1999. The population status and genetic variation in U.S. populations of the Big Bend slider (*Trachemys gaigeae*). Report to U.S. Geological Survey, Species at Risk Program. 35 pp.
- Hink, V. C., and R. D. Ohmart. 1984. Middle Rio Grande biological survey. Unpublished final report submitted to U.S. Army Corps of Engineers, Albuquerque, NM. xii + 193 pp. + appendices.
- Hulse, A. C. 1980. Notes on the occurrence of introduced turtles in Arizona. Herpetological Review 11:16-17.
- Hurlburt, D. D., S. Mockford and T. B. Herman. 1999. Natural history note: *Chelydra serpentina* (common snapping turtle). Aggression. Herpetological Review 30:39.
- Janzen, F. J., and S. O'Steen. 1990. An instance of male combat in the common snapping turtle (*Chelydra serpentina*). Bull. Chicago Herp. Soc. 25:11.
- Livo, L. J., G. A. Hammerson and H. M. Smith. 1998. Summary of amphibians and reptiles introduced into Colorado. Northwest. Naturalist 79:1-11.
- Messinger, M. A., and G. M. Patton. 2000. Passage of the Louisiana law prohibiting the commercial harvest of wild box turtles. Turtle and Tortoise Newsletter (1):19-20.
- Mitchell, J. C. 1994. The reptiles of Virginia. Washington, D.C.: Smithsonian Institution Press.
- Seidel, M. 1984. Rio Grande Nature Center and Preserve. New Mexico Magazine 62(3):17-20.
- Seidel, M. E., J. N. Stuart and W. G. Degenhardt. 1999. Variation and species status of slider turtles (Emydidae: *Trachemys*) in the southwestern United States and adjacent Mexico. Herpetologica 55:470-487.
- Stuart, J. N. 1995. Notes on aquatic turtles of the Rio Grande drainage, New Mexico. Bull. Maryland Herp. Soc. 31:147-157.
- . 1997. Geographic distribution: *Kinosternon flavescens flavescens* (Yellow Mud Turtle). Herpetological Review 28:49.
- . 1998a. Reticulate melanism in southwestern populations of *Chrysemys picta bellii* (Testudines: Emydidae). Herpetological Review 29:80-82.
- . 1998b. Natural history aspects of the Big Bend slider, *Trachemys gaigeae*, in New Mexico. Unpublished final report to the New Mexico Department of Game and Fish, Share with Wildlife Program (Santa Fe) and U.S. Fish and Wildlife Service, Bosque del Apache National Wildlife Refuge. 43 pp.
- Stuart, J. N., and J. B. M. Miyashiro. 1998. Natural history note: *Trachemys gaigeae* (Big Bend slider). Courtship behavior. Herpetological Review 29:235-236.
- Warwick, C., C. Steedman and T. Holford. 1990. Ecological implications of the red-eared turtle trade. Texas J. Sci. 42:419-422.

Book Review: *Amphibians and Reptiles of Texas: With Keys, Taxonomic Synopses, Bibliography, and Distribution Maps* by James R. Dixon, 2nd Edition, Revised.

W. L. Moody, Jr., Natural History Series, Number 25. viii + 421 pp.

Texas A & M Press, College Station, Texas. \$24.95 softcover, \$39.95 hardcover.

Ernest A. Liner

310 Malibou Boulevard

Houma, Louisiana 70364-2598

Email: eliner@mobiletel.com

The long awaited revised edition of that 1987 classic by the leading authority on the Texas herpetofauna is now a reality. Basically the style is the same as the first with updated nomenclature and bibliography. A "Generic Key to the Amphibian Larvae of Texas" by John H. Malone is added. The index has been divided into one for common names *and* one for scientific names. There has been a slight rearrangement of the same photos in the text to conserve space. A Texas county map is shown opposite the frontispiece and again at the beginning of the map section. The first edition had it only at the beginning of the map section. The introduction has been updated, entailing some changes made and the omission of some figures. The glossary has been repositioned in the text and appears between the maps and the bibliography; in the first edition it was after the introduction. Six new terms are added. The new keys reflect all taxonomic changes and additions that have occurred since the 1987 edition except for the recently introduced *Ramphotyphlops braminus*. A note to this effect is given in the species account. Some figures have been reduced and three new ones added.

The distributional maps have been modified to reflect the new changes in Texas distribution. Some larger maps have been reduced to fit two to a page and are numbered. Smaller maps are placed several to a numbered page, each being identified with a letter of the alphabet instead of using the clockwise method of the first edition, which makes for easier locating.

Since the 1987 edition more than 1000 publications on Texas herpetology have appeared and these are included to update the bibliography to April 1999. Just updating the bibliography was a massive job as well as accumulating and evaluating all the new distributional data associated with the various taxa stimulated by the first edition. By accident bibliographic reference 377.325 was found to have an error in authorship. Instead of J. E. McKnight it should be J. M.

Forstner. On page 360 the "book gremlins" left out one reference. Taken from the first edition this reference is: Parmley, D. 1982. Food items of roadrunners from Palo Pinto County, north central Texas. Tex. J. Sci. 34(1):94-95. [Editor's note: In my (hardbound) copy, a corrected page 360 was inserted looseleaf between pages 360 and 361. MAD]

In the species accounts he retains *Siren texana* and states his reasons for doing so. *Syrrophus* has been retained for the Chirping Frogs. *Trionyx* is used instead of *Apalone*. *Ctenosaura pectinata* and *Nerodia fasciata pictiventris* are stated to be well established in the Brownsville area but he does not list them in his introduction of "exotic" introductions, possibly since these are North American forms. He states that at least four new species of *Eurycea* are currently under investigation and that *E. neotenes* is a species complex.

He has added comments, when appropriate, on the status of a number of taxa in the state by the Texas Parks and Wildlife as being on their threatened, endangered or protected lists and also the Federal Endangered Species Act since the 1987 edition.

In a few other instances he has not always followed the recent usage of species/subspecies names but he states his reasons for doing so.

As with the first edition the keys are to the subspecies level but the accounts are to the species level with subspecies listed.

This has been a monumental updating of an extraordinary piece of work on the Texas herpetofauna and will stimulate even more work on the distribution of these forms. I thoroughly recommend this publication for anyone interested in the Texas herpetofauna and adjacent areas. Having it all at one's fingertips from keys, species accounts, distribution maps, and **bibliography** will be a tremendous help to present and future workers in this area and all at a modest price. A job well done, Jim, and one you can again be proud of.

Herps in Hollywood: *Frogs*

by John Kostka

Some may wonder how is it that I am reviewing *Frogs* now. The answer is because, even though *Frogs* was initially released in 1972, it has been re-released under MGM's Midnite Movies (for some of their old horror classics) bill. I figured maybe it deserved another look.

Once I had finished with the film, though, I realized that, even though it has richer, more vibrant colors and a sharper picture, there is no way that this film could be changed. It's still as unintentionally funny and overall *bad* as it always was.

For those of you who haven't seen the film, you've probably seen a film similar to it, but I'll summarize anyway.

The film's opening credit sequence, surprisingly, is actually rather competently filmed (despite the fact that several non-native animals make an appearance). A photographer canoes through a swamp, taking pictures of all things reptilian as well as pollutants and trash floating in the water (this was one of those early '70s ecological warning movies showing how nature will fight back if we continue to destroy our planet).

After this the photographer's canoe is capsized when he narrowly escapes being run down by a motorboat in an inlet. The two in this renegade water vehicle (the drunken clod, played by Adam Roarke, and his beautiful sister, played by Joan Van Ark) return. After helping him out of the water, they invite him back to their grandfather's private island, located deep in the southern U.S. (exactly where we are never informed) for lunch.

Back at the island, our hero, Picket Smith, has a few brief chats with the other guests (serving as character development) gathered there for a birthday/Fourth of July celebration, and then moves inside, where he discovers that the phone isn't working. It is at this point that one of the greatest lines in bad movie history is delivered, as Miss Van Ark remarks casually, "It's probably just the holiday, it'll come back on soon," as though the phone company has just decided to take a break and come back after the long weekend. Unbelievable.

After this we get another half-hour of character development, with tons of gratuitous frog shots to pad out the running time. About 25 minutes into the movie a dead body is found but no one seems to care much. Strange.

Finally, about 50 minutes into the film, the creatures (not only the frogs but all the swamp critters, including leeches, snakes, alligators and lizards—even tokay geckos and tegus) finally decide to attack, all of the aforementioned creatures doing the killing while the frogs look on, seemingly leading the revolt.

This part of the film is *almost* worth the excruciating wait, but since the film is on video you can just fast forward to it. You'll find yourself unable to keep from laughing as the utterly ridiculous attack sequences play out before your eyes. Rattlesnakes (which switch from being rattlesnakes to other snakes when shown in close-up) hiss (they even open their mouths and it can plainly be seen that they have no fangs) and attack. Tegus knock bottles of chemicals off shelves in a greenhouse, creating a noxious gas that asphyxiates one character. Also, there is a shot of one of the bottles in the greenhouse,

and the bottle is labeled simply "poison"—not any particular kind, mind you. In another scene, a man is chased by an alligator, and when it leaps on top of him the guy looks like *he's* giving *it* the death roll! Snapping turtles even attack later on! These attack sequences are so ineptly filmed they will most certainly have you rolling in the aisles, and they come fast and furious, so don't get the idea that you will be able to give your aching sides a chance to rest anytime soon.

Amid these reptilian assaults are a few scenes showing the rest of the survivors attempting to think of a way to escape. Of course, they are detained by the grandfather, Ray Milland, who, like the wicked resort owner in *Jaws* or the microbrewery manager in *King Cobra*, wants them all to stay and continue with the festivities as the rest are slaughtered. Ridiculous.

Finally, a few lucky survivors escape the island, but a horrific (ha!) "surprise" (which you should be able to guess about halfway through the film) awaits them on the mainland.

All in all, *Frogs* is a movie that's so bad it's good, with inept attack sequences and inane plot developments that will have you in stitches, and, while the first half is a bit slow, that shouldn't stop you from fast forwarding through it (though there are a few lines that are pretty funny if you stick it out).

Most likely available at your local video store, priced at around \$14.99 (or maybe your video rental place has it, who knows?), there's a good chance that *Frogs* will prove to be a hilarious treat for any herp enthusiast.

MGM Entertainment, 1972 (re-released 2000), 90 min.

MPAA rating: PG for: mild violence, mild language

Coming Soon

So far there has been no new word as to the release date of Blood Surfer (the film about saltwater crocodiles), and I'm not even sure any more if it is to be released this year. Rest assured, though, that it will some day be released. Jurassic Park III is currently in the works (Sam Neill reportedly stars again). There is word that the Japanese films Gamera 2 and 3 (depicting the adventures of a giant superhero turtle) will be released late this year or in 2001, but nothing is set in stone yet. Crocodile, the new Tobe (Texas Chainsaw Massacre) Hooper film, has finished filming, but no release date has been set. And speaking of Crocodile, the film hasn't even been released yet and already Crocodile II: Death Roll is in pre-production. For those of you who like the old schlocky drive-in kind of reptile movie, Reptilicus 2 (the original concerned a reptilian monster generated from a dinosaur limb) is being planned, almost 40 years after the original's release. Python seems to be moving steadily along, though there is no guess as to when anything (i.e. filming, release, etc.) will happen as of this writing. Also on the python front, Hans Bauer (writer of Anaconda and Komodo) has finished another script titled Snake, which is currently in pre-production. He's thinking of trying one more giant reptile script after this, though so far nothing has been written.

Author's Note: My sincerest apologies in the delay for the review of Godzilla 2000. I will make sure to have it for next issue.

HerPET-POURRI

by Ellin Beltz

Columnist nearly goes extinct

“Last week the City of Chicago issued a permit to a movie company which nearly cost the Chicago Herpetological Society its only regular columnist, Ellin Beltz, a visiting lecturer in Earth Science at Northeastern Illinois University. On Monday, September 25, more than a dozen diesel trucks belched fumes for 17 hours along Clybourn Avenue during filming for a black-exploitation movie currently being filmed in Chicago. Ms. Beltz was overcome by fumes and was treated and released for carbon monoxide poisoning. Carbon monoxide [CO] is an odorless, colorless gas which is heavier than air, but can be detected by inexpensive monitors available at all Chicago hardware stores, Target, K-Mart and other retailers. More than 65,000 people a year die of carbon monoxide poisoning, making it the leading cause of poisoning death in the U.S. according to the U.S. National Institutes of Health. Victims of mild carbon monoxide poisoning often feel that they have the ‘flu’ and do not report their exposures because they do not realize that they have been poisoned. Even if reported, unless physicians test for dissolved carbon monoxide in the blood, the exposure will not be discovered. The test is simple—a clamp is placed on a finger or toe and the reading appears on a digital display. Testing gear is on all City of Chicago ambulances and in hospital emergency rooms. Carbon monoxide detectors are required in all Chicago homes and apartments. Ms. Beltz’s monoxide detector recorded a high reading over fatal limits after she evacuated her apartment. She had previously been exposed to carbon monoxide and was aware of the subtle symptoms of this life threatening gas. Neither the movie office, nor the alderman’s office had any comment on why a 17-hour permit was issued for trucks to park and run in an area of homes and small commercial businesses even though this violates City ordinances about diesel emissions. Other areas of illegally high CO emissions legally permitted in Chicago include McPier properties, Navy Pier and McCormick Place, where diesel and gasoline engines are routinely run inside of sealed buildings as well as CTA bus barns and repair facilities. Meanwhile, five Chicago fire fighters continue their effort to have the City study their ‘cluster cancer’ which they feel was due to diesel fumes emitted by fire trucks within their fire house on Chicago’s near north side. Ms. Beltz said, ‘If you don’t have a carbon monoxide monitor, please go get one. It may save your life, too.’” [September 30, 2000, press release from the Carbon Monoxide Awareness Working Group]

Websites to visit

- The new website for Rainforest Conservation Fund [RCF] “features up-to-date information, field reports and Species Data Sheets, as well as a bulletin board where users can ask questions and leave opinions. The Species Data Sheets include scientific and anecdotal information about animal and plant species found at the Tamshiyacu-Tahuayo Community Reserve in northeastern Peru. . . .” <www.rainforestconservation.org>. [from Greg Neise]

- “It’s not often one sees a web site dedicated to a single species especially *Geochelone platynota*, the Burmese Star Tortoise. The address is: <<http://www.startortoise.com>>.” James Harding writes: “This is an interesting site, with worthwhile information. Veterinary information on antibiotics, etc., could be useful to practitioners. Some of the nutritional information, especially analysis of food values for certain foods, differs from other tortoise care sites on the web; it’s hard to know which is correct!”
- Jim Rowan, the photographer who exhibits every year at ReptileFest, has a new website. Check out <<http://www.rowanpix.com>> for cool graphics of our favorite critters.
- Chicago Wilderness frog monitoring volunteer newsletter <www.neiu.edu/~ebeltz/niftylinks/amphnews.html>. Check out the “what we know now” about Chicago area amphibians and reptiles and the links to frog sites and frog surveys.
- Frequently asked questions about turtle conservation are available from the U.S. Geological Survey Western Ecological Research Center <www.werc.usgs.gov/cc/turtlefaq.htm>. [from James Harding]
- Partners in Amphibian and Reptile Conservation <www.parcplace.org>. “PARC is habitat focused and includes state agencies, the private sector and specialists with an interest in herpetology. They work towards ‘keeping common native species common.’” [FrogLog, February 2000, and James Harding]
- For New Mexico wildlife information visit Biota Information System of New Mexico (BISON-M) Species Accounts: <<http://www.fw.vt.edu/fishex/states/nm.htm>>. Searches: <<http://nrmnhp.unm.edu/bisonm/BISONM.CFM>>. [from J. N. Stuart]
- “Have you checked out *Daily Grist*? It’s a free E-mail summary of the top environmental news from around the globe, served up with a touch of humor. Try it for a few days and see what you think. A recent edition follows. <<http://www.gristmagazine.com/grist>>. To subscribe, send a blank E-mail message to <daily-grist-subscribe@egroups.com>. [It] is a project of Earth Day Network, <<http://www.earthday.net>>.” [from Karen Furnweger]

Amphibian Book Published

Investigating Amphibian Declines: Proceedings of the 1998 Midwest Declining Amphibians Conference edited by Hinrich Kaiser, Gary S. Casper and Neil Bernstein brings together 27 papers from the March 21, 1998, Midwest Declining Amphibians Conference at the Milwaukee Public Museum covers: amphibian malformations, amphibian declines and amphibian natural history. Copies can be ordered from: Jane Vanderlinden, Iowa Academy of Science, 175 Baker Hall, University of Northern Iowa, Cedar Falls, IA 50614. Credit card or phone orders: (319) 273-2021. Checks should be made to “The Iowa Academy of Science.” The price is \$29.95, plus \$1.50 shipping. [from Gary Casper by E-mail]

Keep driving

“An oil slick that has fouled Florida’s Atlantic beaches has threatened 25 sea turtle nests that ‘were expected to hatch Tuesday night’ says the Ft. Lauderdale *Sun-Sentinel* August 8. Volunteers patrolled the beach all night to rescue the new hatchlings and move them to beaches that are not contaminated. The Coast Guard reports that the slick is probably from a ship dumping oil illegally and comes ‘at the peak of hatching season for sea turtles.’ Oil in the water can suffocate the young turtles or ‘ruin their digestive systems.’” [GreenLines, August 10, 2000, #1191; and original papers from Alan Rigerman]

Virus killing North Dakota salamanders

“Scientists have identified ‘a strain of iridovirus’ as the proximate cause of a North Dakota salamander die-off which is ‘the latest in a series of mass amphibian deaths’ says the *Milwaukee Journal* August 9. ‘A whole generation’ of gray western tiger salamanders ‘was wiped out’ by the virus, which also was linked to tiger salamander die-offs in Idaho in 1999 and Utah in 1998 and is ‘implicated in die-offs of spring peepers in Maine; mink frogs in Minnesota; wood frogs and bull frogs, and spotted salamanders in North Carolina; and wood frog tadpoles and spotted salamanders in Massachusetts.’ [GreenLines, August 14, 2000, #1193]

Rattlesnake agreement reached

“The New Jersey Pinelands Commission has reached a ‘partial settlement’ over an earlier agreement that allowed a developer to build 100 homes in vital habitat for an endangered species of rattlesnake says the *Philadelphia Inquirer*, August 12. The commission stopped construction on an additional 200 homes in 1998 after a major rattlesnake den was discovered on the Pine Barrens land. The Commission wants a final settlement by October that balances the developer’s ‘rights as a landowner against the rights of the endangered timber rattlesnake’ but environmentalists say that the commission’s ‘job is to protect. You either save the rattlesnakes or you don’t.’” [GreenLines, August 18, 2000, #1197]

Texas and the environment

- “With the Texas Parks and Wildlife Department [TPWD] scheduled to vote on a proposal to create a ‘no-shrimping zone extending five nautical miles off the state’s southern coast’ on August 31, the Sea Turtle Restoration Project has been mobilizing public pressure on the TPWD and Texas Governor George Bush to take action says *Grist Magazine* August 25. The campaign was prompted by last year’s ‘near-record 450 turtles washed up dead or dying on Texas beaches,’ nearly 100 of which were endangered Kemp’s ridley turtles.” [GreenLines, August 28, 2000, #1203]

- “Days before a final hearing and vote on a proposal to protect endangered sea turtles along the South Texas coast, green sources report August 29 that the state of Texas with the support of Governor George W. Bush has ‘drastically compromised’ new shrimping rules and ‘gutted a proposed shrimp closure.’ The revived rules will ‘do little to protect sea turtles or shrimp’ and according to the Sea Turtle Restoration Project, indicate that Governor Bush has ‘once again put short-term

profits before the environment.’ The original no shrimping rules were essential elements of a preserve too protect sea turtles and marine biodiversity and had received ‘unprecedented’ support from the public, media, environmental and scientific communities.” [GreenLines, September 1, 2000, #1207]

No babies, no future

“Scientists contend that many turtle populations alive today are literally ‘The Living Dead.’ Demographic samples of existing populations indicate a severe decline in the number of juvenile turtles. Without a new crop of young turtles available to replace their elderly counterparts, experts believe that these ancient reptiles will slowly and quietly inch toward extinction. About half of the world’s 270 turtle species are threatened, according to the U.S. Geological Survey. The endangered list includes about 25 species residing in the United States.” [Science Briefs, August 2000, from James Harding]

The million frog marsh and other hoppy tales

- “If finalized, a proposal to designate 5.4 million acres as critical habitat for the California red-legged frog would be the largest in the state and ‘among the nation’s biggest for a threatened species’ says the *Los Angeles Times* September 9. Environmentalists are calling the proposed critical habitat ‘a very significant and important step’ in the species’ recovery and for ‘turning around the decline’ of CA wetlands, 70 percent of which have already been destroyed. Although the building industry was strongly opposed to the protection of wetlands in so large an area, the USFWS was unable to continue to ‘dodge’ the ‘awfully hot political potato’ because of a lawsuit by the Center for Biological Diversity, Earthjustice Legal Defense Fund and other environmental groups.” [GreenLines, September 12, 2000, #1213]

- A story you read here years ago is now receiving world press. “Australian officials relocated the Olympic tennis facility to protect an ‘unused quarry basin’ that was home to the endangered green and golden bell frog says Reuters August 29. In keeping with the ‘Green Games theme’ organizers chose to protect habitat adjacent to the Olympic Park which is home to one of the ‘largest-known remaining bell frog populations’ whose numbers are dropping ‘dramatically’ in many other areas across Australia.” [GreenLines, September 15, 2000, #1216]

- “Prompted by a series of court orders and settlements in response to environmentalists’ lawsuits, the USFWS has quickly moved forward with designating huge swaths of California as critical habitat for endangered species such as the red-legged frog (5.4 million acres) and gnatcatcher (800,000 acres) says the *Los Angeles Times* September 18. Because of chronic under funding by Congress and a rapidly ‘growing caseload,’ however, the understaffed USFWS has resorted to ‘simply drawing humongous circles on the map that satisfy no one’ while hoping to work out the details on permitting specific developments later. Now, one coalition of major developers and utility companies is predicting ‘they’re going to get sued over it probably 100 times in 20 different states.’” [GreenLines, September 19, 2000, #1218]

Invading species

“Exotic wildlife smuggled into Australia is a serious threat to native flora and fauna and to public health and safety through the spread of disease. The [Australian] Department of Natural Resources and Environment warns of dire consequences as animals such as snakes and turtles are increasingly taken home as trendy pets. ‘One of our greatest concerns is that should an owner of an illegal species of snake be bitten, there is simply no anti-venom available to them in Australia,’ says . . . the department’s project leader of pest animals. ‘Even worse, there is the possibility of the animals escaping into the environment.’ The warning follows a court case last week in which a man obsessed with exotic animals was fined \$4000 after Victorian wildlife officers found numerous reptiles in a converted bedroom at his . . . home. [by Simone Fenech and Steve Butcher, September 17, 2000, from Raymond Hoser]

Salamander listed as endangered

“The USFWS has moved September 15 to immediately list the Santa Barbara County population of the California tiger salamander as endangered. This population of salamander could be extinct ‘within one year’ due to habitat loss and fragmentation from agricultural and urban development. USFWS conservation efforts are focusing on developing habitat conservation plans with private landowners and local agencies.” [GreenLines, September 20, 2000, #1219]

Below viability now

“The number of endangered green turtles nesting on Israeli beaches has dropped to around 10 with biologists now saying the population ‘maybe under the red line of possibility’ for recovery says Reuters September 11. Only 1,000 female green turtles, which ‘nest almost exclusively in Israel, Cyprus and Turkey’ are thought to remain. Loss of coastal habitat, ‘plastic trash, fishing nets and speedboat propeller blades’ are the primary threats to their survival.” [GreenLines, September 21, 2000, #1220]

Contributor paid for land

“House and Senate committees have now approved a ‘\$15 million down payment on 1,500 acres of desert tortoise habitat’ currently owned by ‘developer James Doyle’ says Associated Press September 21. In 1996 and 1998, Mr. Doyle made ‘\$8,000 in campaign contributions’ to the bill’s sponsor Rep. Jim Hansen (UT) and stands to get ‘millions more’ under the bill which gives him ‘full market value’ plus ‘damages and interest dating back to 1990.’ After leasing the land in the 1980s, Doyle ‘bought about 2,400 acres from the state in 1990 for about \$800,000.’” [GreenLines, September 22, 2000, #1221]

NMFS rules break laws

“A federal court has ruled that National Marine Fisheries Service management plans for the Gulf of Mexico, New England, Caribbean, Pacific and North Pacific fisheries do not ‘do not comply with federal environmental law’ says ENS September 20. The ruling, in response to a lawsuit by the American Oceans Campaign and eight other conservation groups, confirms charges that NMFS failure to adequately

regulate ‘non-selective fishing methods like trawling’ are seriously harming fish habitat and ‘survival rates.’”

[GreenLines, September 25, 2000, #1222]

Shellular communications

“A tele-communications company that lays fiber-optic cables for the internet, voice and data transmissions has agreed to ‘donate \$1.2 million to the Nature Conservancy’ to ‘avoid prosecutions and fines’ over damage done to ‘40 wetlands that are potential habitats’ for endangered bog turtles says the *Philadelphia Inquirer*, September 21. The violations are among the ‘most serious’ ever in southeastern Pennsylvania where loss of habitat is the ‘critical threat to bog turtles.’” [GreenLines, September 26, 2000, #1223]

IUCN Red List released

“I am forwarding this note on the newly released IUCN ‘Red List’ as a point of interest, since we are all involved in wildlife education or management in some way. There seems to be considerable justification for the belief that we are seeing the early beginnings of a mass extinction of life on this planet that could eventually rival any previous extinction over geological time. We must at least stay aware of what is going on beyond our own area of interest and expertise if we are to have any chance of slowing this process. Visit <www.iucn.org/redlist/2000/> for the full text. James Harding” Quoting from the report for species of interest to CHS members: “The increase in the number of listed reptiles, from 253 threatened in 1996 to 291 in 2000, is mostly due to a focused analysis of the status of freshwater turtles and tortoises, especially freshwater turtles in Southeast Asia. The number of Critically Endangered species has increased from 10 to 24 and Endangered from 28 to 47 species. The rapidly deteriorating status of tortoises and freshwater turtles in Southeast Asia is due to heavy exploitation for food and medicinal use. Hunting of these species is unregulated and unmanaged, and the harvest levels are far too high for the species to sustain. As populations disappear in Southeast Asia, there are disturbing signs that this trade is increasingly shifting to the Indian Subcontinent, and further afield to the Americas and Africa. Other Asian species, such as snakes and salamanders, are also heavily exploited for use in traditional Chinese medicine, but the effects of this and other pressures on most of these species have not yet been assessed.”

The future of NICOR contaminated Illinois?

“The first comprehensive study of mercury distribution in the Sierra Nevada region has found that significant quantities ‘left over from California’s Gold Rush days’ are still accumulating in fish, frogs and invertebrates says the *San Francisco Examiner* September 26.” [GreenLines, September 28, 2000, #1225]

Thanks to everyone who contributed to this month’s column and to everyone who sent clippings which I will use next month and beyond. You can contribute, too! Send whole pages of news or magazines with your name on each piece to me: Ellin Beltz, 1647 N. Clybourn Avenue, Chicago, IL 60614-5507. Letters and text only (no graphics, bugs or viruses!) to my E-mail: <ebeltz@ripco.com>.

Herpetology 2000

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

PACIFIC ISLAND BOA RELATIONSHIPS

C. C. Austin [2000, Copeia (2):341-352] examined the enigmatic biogeography of Pacific island boas of the genus *Candoia* using DNA sequence variation from a portion of the mitochondrial cytochrome b gene. Estimates of the phylogenetic relationships and genetic distances between *Candoia* and the Old World (*Sanzinia*) and New World boids (*Boa*, *Corallus* and *Epicrates*) suggest that a recent dispersal event from the Americas is not responsible for *Candoia*'s Papuan distribution. The author sampled multiple populations from the three *Candoia* species to distinguish whether substantial evolutionary partitions exist within species as a result of colonization patterns or geographical barriers and to assess whether genetic partitions are concordant with species boundaries. In all analyses, *Candoia* and the Madagascan *Sanzinia* are sister taxa, and *C. bibroni* is basal to *C. aspera* and *C. carinata*. Mean sequence divergences between *Candoia* and the other boid genera *Sanzinia*, *Corallus*, *Epicrates* and *Boa* are 0.19, 0.23, 0.24, and 0.25, respectively. Within *Candoia*, mean interspecific sequence divergence ranges from 0.13, between *C. aspera* and *C. bibroni*, to 0.16 for both *C. aspera/C. carinata* and *C. bibroni/C. carinata* pairwise comparisons. Large intraspecific sequence divergence (up to 0.13 within *C. carinata*) exists within *Candoia* species demonstrating deep separations corresponding to patterns of island colonization and geographic barriers in New Guinea.

MASSASAUGA ECOLOGY

G. Johnson [2000, J. Herpetology 34(2):186-192] notes that the eastern massasauga (*Sistrurus catenatus catenatus*) is listed as endangered in New York and is currently known from only two locations in the state. Characteristics of this species' spatial ecology and habitat preferences were investigated between 1989 and 1992 in Cicero Swamp, a large wetland complex near Syracuse, New York, which contains a 37 ha peatland of critical importance to massasaugas. Radiotelemetered males (N = 11) and nongravid females (N = 2) left the peatland for nearby swamp forest soon after spring emergence while gravid females (N = 2) remained in the peatland until parturition. All telemetered snakes overwintered in the peatland. Of individuals tracked for the entire active season, gravid females moved significantly shorter distances per day ($\bar{x}$ = 7.1 m) and per season ($\bar{x}$ = 751.9 m) than either males (mean distance/day = 20.5 m; mean distance/season = 2940.2 m) or nongravid females (mean distance/day = 22.9 m; mean distance/season = 3712.2 m). Similarly, 100% minimum convex polygon activity range estimates were smaller for gravid females ($\bar{x}$ = 2.0 ha) than for either males ($\bar{x}$ = 27.8 ha) or nongravid females ($\bar{x}$ = 41.4 ha). These findings suggest that conservation efforts for eastern massasaugas in Cicero swamp should focus on peatland habitat used by gravid females.

DIETARY SOURCES FOR ALKALOIDS IN POISON DART FROGS

J. W. Daly et al. [2000, J. Chemical Ecology 26(1):73-85] report that fresh leaf litter, collected mainly during the dry season in Pacific Panama, apparently can provide dietary sources for some of the many alkaloids detected in skin extracts of poison frogs (*Dendrobates auratus*) found at the same site. *D. auratus* raised in screened or glassed-in outdoor cages and fed primarily on fruit flies contained only one major alkaloid in skin extracts, with traces of a few others. *D. auratus* raised in a large, screened, outdoor cage and provided for six months with leaf litter from the frog's natural habitat, accumulated at least 16 different alkaloids into the skin. The major classes of alkaloids provided by the leaf-litter arthropods are pyrrolizidines and indolizidines known from myrmicine ants, a tricyclic known from coccinellid beetles, and spiropyrrolizidines, putatively from millipedes. In addition, one species of myrmicine ants collected at the leaf-litter site was found to contain a particular decahydroquinoline isomer that was also present as a minor alkaloid in skin from the microsympatric *D. auratus* population, while another species of myrmicine ants from a small island contained pyrrolizidine isomers in the same 3:1 ratio that was found in the skin of *D. auratus* from the island.

RESPONSES OF SNAKES TO DISTURBED HIBERNATION

J. Burger et al. [1999-2000, Herpetological Natural History 7(1):59-66] note that in the wild, mammalian predators sometimes dig up hibernacula and prey upon overwintering snakes. The authors disturbed 198 northern pine snakes (*Pituophis melanoleucus*) and 41 northern black racers (*Coluber constrictor*) during hibernation in late winter when air temperatures were 7-10°C, and recorded their responses. They measured the snakes' ability to protect themselves and to escape from a simulated predator. Within 2 min of excavation, 41% of racers and 49% of pine snakes began to move, and about 25% struck defensively at a stimulus. Nearly 29% of pine snakes hissed, whereas only 5% of racers did so. There were few significant differences in behavioral responses between the two species. However, pine snakes had significantly lower inter-strike intervals than did black racers and struck sooner at a stimulus than did black racers. For pine snakes, time to first hiss, height of the first strike, and distance moved decreased with increasing cloacal temperature (mean = 7.5°C, range = 4-12°C), but increased with body size (mean = 545 g, range = 24-1414 g). Because of low body temperatures, neither species had the ability to move very far when first taken from hibernation. The snakes' delayed reaction and low defensive behavior rates suggest that neither species could avoid predation under these circumstances.

LURING BROWN TREESNAKES

A. C. Lindberg et al. [2000, *Copeia* (3):886-888] tested the importance of prey movement for stimulating feeding behavior of brown treesnakes, *Boiga irregularis*, by using a mechanical mouse model in combination with and without prey odor. Prey movement was found to be important in stimulating brown treesnake feeding behavior. Prey movement combined with prey odor was not significantly different than prey movement alone. In the development of simple artificial lures based on the stimulus of live mice, visual lures lacking movement are likely to be ineffective. Lures that combine a visual moving stimulus with prey odor are likely to be the most effective artificial lure for trapping brown treesnakes.

FEMALE SNAKES SMELL WORSE

K. J. Kissner et al. [2000, *J. Herpetology* 34(3):491-493] report on sexual differences in the odor of musk secretions produced by snakes. The two snake species used in the double blind experiment were black rat snakes (*Elaphe obsoleta*) and eastern garter snakes (*Thamnophis sirtalis*). One experimenter prepared pairs of cotton swabs with musk secretions from one male and one female of the same species. The swabs were presented to the observers (10 volunteer university students) by a second experimenter, who was unaware of which swab corresponded to which sex. The observers were unaware of the goal of the study and were told only that they were smelling musk secretions of snakes, with the goal of determining which swab in a pair was more offensive. For black rat snakes, the musk of females was chosen as more malodorous in nine of 10 trials, a result that differed significantly from that expected by chance ($N = 10$, $P = 0.01$). For eastern garter snakes, the musk of females was chosen as more malodorous in eight of 10 trials, again a significant result ($N = 10$, $P = 0.05$). The authors discuss why, if having more malodorous musk does help to decrease predation risk, male and females apparently do not take equal advantage of this benefit.

TREMATODE INFECTIONS AND LIMB MALFORMATIONS IN BULLFROGS

J. L. Christiansen and H. Feltman [2000, *J. Iowa Acad. Sci.* 107(3-4):79-85] examine the correlation between malformed bullfrogs, *Rana catesbeiana*, and infestation with parasite (trematodes) infections in Iowa. Malformed frogs were present in only one pool and these frogs had significantly higher trematode infection than non-malformed frogs from nearby pools. Random tissue samples showed that malformed bullfrogs carried larger infections than non-malformed frogs from the affected pond or non-malformed frogs from elsewhere in the study area. Malformed limbs that lacked normal musculature also carried trematode infections, whereas non-malformed limbs did not, and frogs missing limbs always had subcutaneous infections. The authors discuss the hypothesis that trematode infections are the cause of malformations, versus the hypothesis that chemically weakened frogs or tissues are more easily infected by trematodes. They suggest that the relationship between malformation and parasite infections is evident only when samples include metamorphosing frogs.

SEXUAL DIMORPHISM AND SEX RATIO IN A TERRESTRIAL GIRDLED LIZARD

P. L. F. N. Mouton et al. [2000, *J. Herpetology* 34(3):379-386] report that the large-scaled girdled lizard, *Cordylus macropholis*, uses the succulent *Euphorbia caput-medusae* as microhabitat in the dry western coastal regions of South Africa. Up to nine individuals were found to share the same plant shelter. No cases were recorded where two or more adult males shared a plant. Groups consisting of an adult pair and a varying number of juveniles predominated, but several cases were recorded where an adult male shared a plant with more than one adult female. The largest individuals in the sample were females. The axilla-groin length of adult females was significantly larger than in males, but males had larger heads and longer tails than females. Adult males had twice the number of femoral pores as females and also significantly more generation glands. Neonates had the same number of pores as adult males indicating that males and females are born with the same number of pores, but that the outer pores degenerate in females during maturation. The ratio of adult males to adult females was highly skewed towards females (1:2.39). This female-biased sex ratio was also observed in the juvenile size class (1:2.07). The scar incidence recorded for adult males was two times that recorded for adult females.

DIGESTIVE EFFICIENCY OF PYTHONS

G. S. Bedford and K. A. Christian [2000, *Copeia* (3):829-834] examined the digestive efficiencies of seven taxa of Australian pythons with respect to body temperature, meal size, and passage time. The hair of rodents was not digested by the snakes. Digestive efficiencies were not influenced by body temperature, and the values ranged from 89% to 98% if hair was included and from 99.3% to 99.8% if hair was excluded from the analyses. The digestive efficiency of different food types can be made more comparable by taking into account the known indigestible components. Passage time was significantly longer at 24°C than at 30 or 33°C. Passage time was not related to relative meal size.

CROCODILE NESTING ECOLOGY

S. G. Platt and J. B. Thorbjarnarson [2000, *Copeia* (3):869-873] studied the nesting ecology of the of American crocodile, *Crocodylus acutus*, in coastal Belize from June 1996 to July 1997. Most nesting areas were found on elevated beach ridges composed of coarse sand. Shallow, brackish lagoons adjacent to nesting areas provide critical nursery habitat for hatchlings. The most significant nesting areas were found in the Turneffe Atoll. American crocodiles construct both hole and mound nests in Belize. Clutches are deposited during the last half of the dry season, from late March to early May. Mean clutch size is 22.3 ± 6.0 eggs. Hatching occurred from late June to mid-July, a period coinciding with the beginning of the wet season. Nesting success was high, and losses to predation and flooding were negligible. Females may defend nests from predators and excavate neonates at hatching. The protection of suitable nesting and nursery habitat is essential for the continued survival of the American crocodile in Belize.

TÚNGARA FROG EGG-LAYING SITES

M. E. Dillon and J. Fiaño [2000, *Copeia* (3):883-885] studied oviposition behavior of túngara frogs, *Physalaemus pustulosus*, using paired choice tests in small terraria. Given two possible nest construction sites (a dish with a conspecific nest in water and a dish with just water), pairs preferred to build nests in dishes that held only water. Avoidance of conspecific nests during oviposition may increase fitness by limiting potential intraspecific resource competition and by preventing tadpole growth inhibition.

SONORAN MUD TURTLE ESTIVATION

C. C. Peterson and P. A. Stone [2000, *Copeia* (3):684-700] note that Sonoran mud turtles (*Kinosternon sonoriense*) are widely believed to be restricted to permanent bodies of water, yet some populations apparently thrive in canyons that dry completely. They investigated the possibility that these turtles could estivate by subjecting individuals collected in the Peloncillo Mountains of New Mexico to 11 weeks without food or water. Turtles apparently used water stored in the urinary bladder to osmoregulate early in the period of deprivation. However, by the end, several blood chemistry parameters (including plasma osmolality, sodium and potassium concentrations, and blood urea nitrogen) had increased anhomeostatically to very high levels; most variables returned to original levels on rehydration. Hematocrit and plasma protein levels were unaffected, suggesting preferential defense of plasma volume by dehydrating turtles. Individuals varied in their burial behavior, and individuals that were surface active became more dehydrated and accumulated more urea than those that remained buried. The authors were unable to demonstrate metabolic depression or a decrease in evaporative water loss (EWL) during the trial, but rates of resting metabolism and EWL in *K. sonoriense* were similar to those of identically treated Oklahoma-collected *K. flavescens* (a species well known to estivate). *Kinosternon flavescens* produced less nitrogenous waste than did *K. sonoriense* and may have been more uricotelic but also incurred more severe hypernatremia. All but one *K. sonoriense* recovered upon return to water. The authors conclude that Sonoran mud turtles from this population are physiologically capable of surviving many weeks without food and water. The concept of estivation as a special physiological state (as opposed to a behavior) is critically discussed.

CRICKET FROG MALFORMATIONS IN ILLINOIS

R. H. Gray [2000, *J. Iowa Acad. Sci.* 107(3-4):92-95] summarizes the frequency of abnormalities (classified as ether missing limbs, or deformities which included extra limbs, malformed limbs or digits, or mouth parts) in 9,987 cricket frogs, *Acris crepitans*, examined in 28 Illinois populations between 1968 and 1971. Total frequency of abnormalities was 0.39%. Most of the abnormal frogs (0.32% of total sample) had missing limbs which might be attributed to amputation from predator encounters. Only 0.07% of the sample comprised frogs with deformities.

BIOLOGY OF THE RUBBER BOA—PART I

R. F. Hoyer and G. R. Stewart [2000, *J. Herpetology* 34(3): 348-354] conducted a five-year field and laboratory study of the southern rubber boa (SRB), *Charina bottae umbratica*, in the San Bernardino Mountains of southern California. The study provided data on the capture, size, sexual dimorphism, age classes, and reproduction of this state listed subspecies. The use of artificial cover substantially improved capture success. Juvenile, subadult, and adult age classes were described. Mean total length and weight of live measured adult females were significantly greater and mean tail length (% total length) was significantly less than for males. Adult females also tended to have greater percentages of tail tip scarring and shortening than males. There was no sexual dimorphism in these characteristics among neonates, and the neonatal sex ratio was female biased. Total weight loss in gestating females averaged 47% of initial weight, the components being young and ova 28.3%, body reserves 15.3%, and combined embryonic membranes and fluids 3.3%. Relative clutch mass was 0.369. In these respects, the SRB was notably similar to boas from northwestern Oregon, differing primarily in its smaller body size and lighter color.

BIOLOGY OF THE RUBBER BOA—PART II

R. F. Hoyer and G. R. Stewart [2000, *J. Herpetology* 34(3): 354-360] conducted a five-year field and laboratory study of the southern rubber boa (SRB) in the San Bernardino Mountains of southern California. The study provided data on the diet, antagonists and predators of this state listed subspecies. In laboratory feeding trials, both adult and juvenile SRBs readily consumed lizard eggs, and adults also took nestling rodents and insectivores. Field and laboratory observations of both Oregon boas and SRBs indicated that most injuries to the tail tips of SRBs are from female voles, moles, and other small mammals defending their young against boa predation. These observations also suggested that the principal reptilian predators of SRBs are *Diadophis punctatus* and *Lampropeltis getula*. In these respects, the SRB was similar to most other rubber boas and differed primarily in its tendency to eat lizard eggs rather than lizards.

PHOTO-ENHANCED TOXICITY TO TADPOLES

E. E. Little et al. [2000, *J. Iowa Acad. Sci.* 107(3-4):67-71] examined the interactive effects of ultraviolet light and aquatic contaminants on the larval development of *Hyla chrysoscelis* and *Rana sphenoccephala*. The contaminants included a carbamate insecticide and weathered petroleum. Contaminants were exposed to varying intensities of simulated solar radiation (SSR) provided by indoor UV lamps. While treatments which used contaminants alone caused increased mortality in *H. chrysoscelis*, synergistic interactions between SSR and the contaminants caused much greater mortality in both *H. chrysoscelis* and *R. sphenoccephala*. Relatively little SSR was needed to initiate photoenhanced toxicity. The authors point out the importance of evaluating the interactive effects of environmental stressors in amphibian habitats.

The Tympanum

The Virtual Museum of Natural History at curator.org

Introduction

The last two decades of the twentieth century have rightfully been seen as a period where computerization has made unprecedented amounts of information available to an equally unprecedented number of people. The form and nature of these data range from simple texts about mundane subjects to multimedia programs about the most esoteric levels. This information deluge has been driven largely by the World Wide Web and global Internet access.

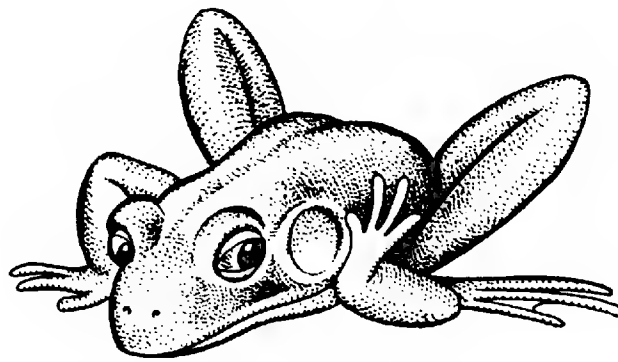
Not surprisingly, the availability of data has far outpaced the development of adequate indexing and retrieval systems. Among the Internet browsers, Northern Light is the most comprehensive service, yet it has only indexed less than 15% of total web sites. Not only are many web sites not listed by large search engines, the vast majority are neither peer reviewed nor content edited. This means that a user has a statistically high likelihood of accessing inappropriate, incomplete, or incorrect data once a subject site is located.

In 1996, Young Forest Company, a for-profit electronic publishing organization, began to tackle the problem of coordinating subject-related web sites with more traditional information sources, resulting in The CURATOR Project. This program develops interactive keys to animal groups on a worldwide scale; the first product was a key to elasmobranch fishes of the world [Sprackland, R. G. 1999. A key to the sharks and rays of the world. The CURATOR Project, CD-ROM. Belmont, CA: Young Forest Company]. The CURATOR Project was also used to demonstrate for the first time how electronic publishing would work to conform to new ICZN requirements for official publication of new taxon names by describing seven new species of Australian sharks.

Subsequent to this, the staff of Young Forest Company decided that a greater web of data acquisition was needed, and that such a site would also need some sort of peer evaluation prior to listing. Young Forest Company thus donated much of its software and design to a new corporation, the Virtual Museum of Natural History (VMNH). In order to provide a free universal database to all interested users, the VMNH was incorporated as a non-profit/charitable organization in the State of Washington in 1998, and received recognition as a 501c(3) corporation by the IRS in 2000. The goal of the VMNH is simple: to provide ready basic data about all species of animal life along with quality-assessed links to additional and more extensive information and researchers. Thus, even if the final data come from other sites, the VMNH would be the initial portal open to all users.

The International CURATOR Project

As part of the VMNH, the major web presence is the International CURATOR Project. Unlike the earlier CURATOR Project, which is an interactive series of keys, the International CURATOR Project is an electronic file-card system to all the world's animals. In particular, early phases center around the major research interests of the founders, i.e., herpetology and



ichthyology. The user will access the VMNH site at curator.org, and be taken to the museum's homepage. By clicking on "Kingdom" a user will be taken to a chart of animal taxa. Clicking further will take a user to whatever taxonomic level is desired for summary information at that level. Most vertebrates will be outlined to the species

level, while insects are currently written to ordinal levels.

Each species account will contain basic "catalogue" type information, including name (common and scientific) of organism, diagnosis, description, range, size, habitat, reproduction, taxonomy and relationships, and other data as determined by the account's author. All accounts also feature illustrations of the organisms (to include all variants, including those associated with age and sexual dimorphism), and links to further quality reviewed information. Among the latter resources will be links to other web sites, active researchers, museum collections, breeders, and literature. Thus, if a reader wishes to purchase a referenced book or journal, clicking on the reference takes her to the publishers/distributors site for immediate electronic ordering. The VMNH currently is an associate of Amazon.com, and receives a percent of all sales from Amazon that originate from curator.org.

The Contributors

The strength of the International CURATOR Project lies in utilizing the very best resources and authorities. In the first year of operation, the VMNH has enlisted as advisors and contributors prominent researchers from a host of institutions and private sources, including the American Museum of Natural History, Australia Zoo, Australian Museum, Australian Reptile Park, Field Museum of Natural History, The National Museum of Scotland, Queensland Museum, Senckenberg Museum, Texas A & M University and others. By writing and editing accounts, and supplying reliable resource information for more detailed inquiries, the advisory board will help insure that the VMNH is a most useful and easy to access first stop for any zoological research done at any level. With the inclusion of links to museum and zoo holding catalogues, researchers can save considerable time in locating essential specimens for study.

The International CURATOR Project also includes the photographic, videographic, sound recording, and review talents of any persons with expertise to contribute. At the present stage of operation we are soliciting persons with slide collections to share as well as data to contribute for general distribution.

Additional Services of the VMNH

The value of the VMNH will reside in its usefulness to the wider zoological community. The International CURATOR Project will serve for providing data about species and higher taxa. We shall also post information about ongoing research by staff and contributors. This should open a forum for researchers to request assistance from users, in the form of donations, volunteers, specimens, or literature. Organizations are also encouraged to use the "Information Sought" pages to post job and grant announcements. In July 1999 the VMNH

used this section to post a plea for a letter writing campaign to help preserve critical habitat for the Utila Island iguana at the request of a herpetologist from the Senckenberg Museum.

The VMNH is also slated to provide a new publications review section, in which books and periodicals will be illustrated, briefly reviewed, and links to purchase sites provided. Review books, periodicals, and reprints should be sent to the VMNH as early as possible to assure timely inclusion on the site. We are also particularly interested in receiving notices of new taxa, so information may be quickly released to the widest audience of interested zoologists.

The mission of the VMNH is not to compete with existing museums, but to complement existing on-line services by either providing links to reviewed, quality information, or supplying data that fills in gaps. General background articles (i.e., on Species, Evolution, and Biodiversity) are intended as starting points for general audiences.

In 1999, the VMNH became active in one traditional museum function, performing biodiversity surveys. This will be the main research focus of the organization, and strategic alliances to conduct projects have been formed in Australia and Papua New Guinea. The VMNH intends to secure permission and permits to investigate poorly or unexplored regions, recruit interested individuals from various organizations, and facilitate their access to the fauna and local resources. Preliminary reports of VMNH surveys are, and will continue to be, posted

under the Museum Publication's "Expedition Reports" section.

Sponsorship

In order to operate as a free data source, the VMNH is soliciting contributions from corporate and private sponsors, as do conventional museums. Donations are tax-deductible in the United States, and the VMNH staff is planning to register overseas so other contributors may be included. Corporate sponsorship may be in the form of outright grants, sponsorship for a particular site or topic (much as temporary exhibits in museums are corporate sponsored), or made available by buying portals to corporate sites from specific portions of the VMNH (through its virtual gift shop). Though the structure and access are electronic, operation and sponsorship will follow traditional museum funding models.

Additional detailed information about the VMNH, its goals and structure will always be available on the web site at curator.org.

Daniel Diessner and Robert George Sprackland

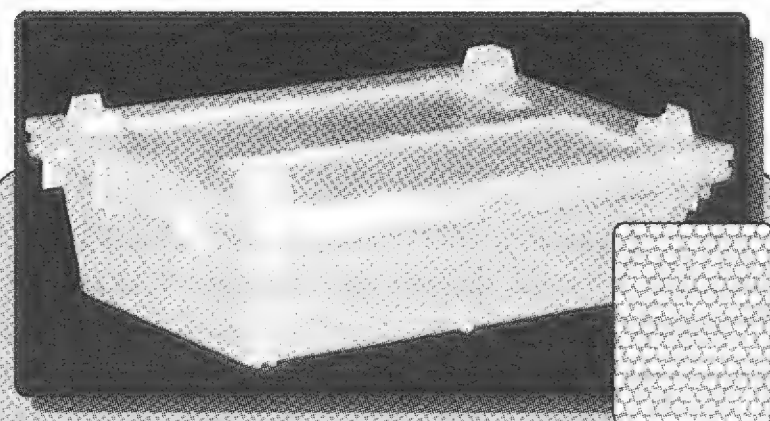
E-mail (RGS): director@curator.org.

[Note: Dan Diessner, M.S., is a lead project manager for the Boeing Corporation's flight entertainment systems in Seattle, Washington. He is also the Chief Engineer for Young Forest Company and the Virtual Museum. Robert Sprackland, Ph.D., is Co-founder of both Young Forest Company and the VMNH, of which he is also Director and Chief Knowledge Officer. Both may be reached at the Virtual Museum of Natural History, POB 326, Mukilteo, WA 98275.]

Health Food for your herps!



Highest quality rodents are available in all sizes from pink mice to jumbo rats. Fresh frozen crawler mice are only 17¢ each in lots of 2,000. All frozen animals are shipped in insulated boxes.



Nearly 9,000 holes and they still can't escape!

The new TTC is ideal for transporting, breeding and storing your mice, rats, snakes and lizards. The strong plastic TTC has over 2,200 holes on each side and over 4,500 holes on the lid to provide maximum air circulation even when stacked. Each TTC can be divided into 2, 3 or 4 compartments and its smooth plastic construction makes washing a snap.

273 Hover Avenue • Germantown, NY 12526-5320
518-537-2000 • Fax 518-537-7287

Unofficial Minutes of the CHS Board Meeting, September 15, 2000

The meeting was called to order at 7:36 P.M. Board members Karen Bielski, Rich Crowley, Gary Fogel, Marcia Rybak, Steve Spitzer and Jenny Vollman were absent. A quorum was not present.

Officers' Reports

The minutes of the August 18, 2000, Board of Directors' meeting were read by Emily Forcade. Corrections were made.

Jack Schoenfelder presented the Gary Fogel's treasurer's report.

Membership Secretary Mike Dloogatch reported a net loss of 10 members this month; the September mailing stood at 815. Special interest group membership guidelines will be discussed at the next board meeting.

Vice-President Lori King reported that Robert Sprackland would be speaking at the general meeting in September on population differences in the herps of Papua New Guinea and northern Australia. He will be focusing on monitors. Lori has sent a picture to the *Tribune* and Jack will send some to several Indiana papers. Iggy Ihrig has offered to bring a monitor and Rich Crowley will bring a blue-tailed monitor so they will do the Animal of the Month presentation.

The Dutch Iguana Society will be doing a presentation in October about what organizations are doing about the Uta Island Iguana Project. They will be talking about the work being done by the CHS. Lori also mentioned that, unfortunately, she has not received any donations for the auction being run by ACRA to fund production of a video advocating rattlesnake roundup reform.

Publications: Mike Dloogatch reported that according to an E-mail from Marcia Rybak she is working at correcting the continuing problems with access to our website. Mike also reported that Chris Lechowicz has indicated that he will want to purchase some books to help in his new position as web-master.

Standing Committees

Shows: Claus Sutor expressed his thanks to Ron Humbert for taking the lead in exhibiting at the Spring Brook Nature Center. Jack added that thanks should also be extended to Claus for coordinating our participation.

A discussion followed about allowing venomous animals to be shown by people at CHS run exhibitions. Linda Malawy spoke in support of allowing members to exhibit such animals as long as care was taken to keep them in secure enclosures. Mike pointed out that in the past, he has been in situations where people were allowed to do this under guidelines, and that some people, nonetheless, did not follow the established rules. Once you allow this, you have to be prepared to stand behind these rules and history has shown that most people dislike being in the role of an enforcer. Another issue is insurance. The exhibition of venomous reptiles would triple to quadruple our rates. Even if we wished to pay the higher cost,

Lori pointed out that this calls our insurer's attention to us. They are already sensitive to the exhibition of crocodilians. Linda expressed her appreciation of these concerns but stated that the educational value of a properly done exhibition should be an impetus to not closing the door on further discussion.

Adoptions: Linda Malawy said she has four box turtles and an unidentified large tortoise she requested the group's help in identifying. She also had a number of alligator and iguana calls. Jack offered to take the box turtles.

ReptileFest: Darin Croft distributed handouts summarizing his investigation of five different venues for the Fest. The most promising option is UIC, for which he presented a detailed analysis of pertinent issues relating to availability on our preferred dates, cost, room size, parking, loading, access to public transportation and cooperation of facility personnel. He also provided a diagram of the UIC campus and a diagram of the specific rooms available for our use. We can have access to the facility at 8:30 on Friday evening before the Fest. We can have our first choice dates of March 24–25. Tables are available and included in the cost. Since an electrician is recommended, UIC is willing to lower our cost to compensate for the electrician's fee. It is not yet clear what security arrangements can be made for animals left overnight. The entire group enthusiastically supported using UIC and agreed that it was superior to using Northeastern again. Darin said he was still looking into Lake Forest College as a possibility, but it was far away. UIC continued to be the preferred choice. The Arlington Show is one week before so this should act as an additional boost for attendance. The contract will be finalized as soon as possible.

Ad Hoc Committees

Symposium 2001: Char Haguewood reported that the owner of ECO (Bob Ashley) and the owner of the Chicago Reptile House (Brian Potter) are planning a breeder's expo for the weekend of 10/12/2001. Bob and Brian plan on a 50,000 sq. ft. exhibition. They have invited the CHS to combine the Symposium with the expo, either at our venue or another (Tinley Park Holiday Inn). Char said that a benefit for us would be that we would not have to run a breeders' show ourselves. A down side would be that our speakers and banquet are planned for Saturday and Sunday, with a Friday night breeders' expo, so a weekend expo would interfere with our speakers. Jack said that we have always stayed on the non-profit side of the tax issue. When we get into their breeders' expo as a society, we wind up in a for-profit area. There was a general agreement that we continue with our plan to have the symposium at the Radisson in Schaumburg on October 19–21, 2001. Char suggested that we discuss the symposium at each general meeting and describe what it consists of. Char mentioned that the Radisson agreed that we will not be charged for the meeting rooms if we can fill at least 80 guest rooms each night. We are giving them a deposit which will be applied to food and beverages. Char requested, and Mike Dloogatch agreed to, a page in the *Bulletin* dedicated to the symposium.

Awards: Greg Brim reported that the committee's work is nearly complete, with the possible exception of the need for a commemorative gavel if our current president does not succeed himself.

Old Business

Char Haguewood discussed the Chicago Wilderness Society, an organization which promotes work toward biodiversity. She distributed brochures which describe the organization and the guidelines for membership. Membership is by invitation and election. If the CHS were elected, we would be general members. In order to qualify for the next round of elections, we need to apply by October 16. There was a general agreement that it was useful for us to apply for membership and that this would be a good way of getting our name out to the public. Char suggested that we spend some time at the meeting addressing some of the questions in the application. Some of our major actions toward biodiversity include the Salamander Safari, ReptileFest, working with the CAS, assisting the Chicago Botanical Garden in repopulating their area with native herps, annual research grants, monthly presentations at the general meetings, and the monthly *Bulletin*.

Char also mentioned that the Environmental Network will publicize activities we do related to conservation and education. Jack and Lori volunteered to fill out some forms which describe these.

CHS Mission, Vision and Values Retreat: Jack requested that the retreat be held in Valparaiso, Indiana, where he has been able to arrange appropriate meeting facilities at Ivy Tech State College. He asked if there were any objections to driving there. Everyone present agreed that driving there should not be a problem.

New Business

Jack said that Dave Hurd from the Sherman A. Minton Student Transportation Awards Committee contacted him to let him know that the committee arranges for awards for deserving students to travel to the July 2001 SSAR/ASIH meeting. Jack was informed that it was possible for the CHS to contribute and wondered what the group thought. The group was interested in making a donation. Since there was no quorum present, the specifics of the contribution were deferred until the next meeting.

Jack also reported that *Reptile and Amphibian Hobbyist* magazine has written offering us complimentary issues for events. Do we want to avail ourselves of this? A question was raised about whether they might wish to purchase table space at ReptileFest. No action was taken.

Linda Malawy wondered if there was a way our website could be linked into the Chicago Events Calendar. Steve Spitzer has some contacts in this area and may be able to explore this.

Round Table

Lori King reported that she and Char Haguewood participated in a National Iguana Awareness Day program at the Scovill Zoo in Decatur, Illinois. They were there at the invitation of Lisa Henley, head of the Illinois chapter.

Claus Sutor mentioned how nice it was to have a membership list.

The meeting adjourned at 9:45 P.M.

*Respectfully submitted by Emily Forcade for
Recording Secretary Karen Bielski*



Advertisements

For sale: Frozen rodents now available at the General Meeting starting July 26! Just another good reason to come to the meetings at the Chicago Academy of Sciences Patty Notebaert Nature Museum. Assorted sizes of rats and mice. Call Rich Crowley at (708) 485-5705 for details and pricing.

For sale: rats and mice — pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, 6115 SW 137th Avenue, Archer FL 32618, (352) 495-9024, E-mail: GrmtRodent@aol.com.

For sale: murine-pathogen-free rats and mice available in all sizes, live or frozen: pinkies, fuzzies, crawlers, small, medium and large. Frozen crawler mice in lots of 2000, \$.17 each. Also available, full grown hairless mice. FOB shipping point. Master Card accepted. Call (518) 537-2000 between 8:00 A.M. and 5:00 P.M. or write SAS Corporation, 273 Hover Avenue, Germantown NY 12526 for prices and additional information.

For sale: from **The Mouse Factory**, producing superior quality, frozen feeder mice and rats. We feed our colony a nutritionally balanced diet of rodent chow, formulated especially for us, and four types of natural whole grains and seeds. Mice starting from: pinks, \$.17 each; fuzzies, \$.24 each; hoppers, \$.30 each; weanling, \$.42; adult, \$.48. Rats: starting with pinks at \$.45 each, to XL at \$1.80 each. Discount prices available. We accept Visa, MC, Discover or money orders. P.O. Box 85, Alpine TX 79831. Call us **toll-free** at (800) 720-0076 or visit our website: <http://www.themousefactory.com>.

For sale: from Bayou Rodents, excellent quality feeder mice and rats. Every size available. Pinks starting at \$20/100. Orders are shipped by overnight service Monday thru Thursday. We accept Visa, MasterCard and Discover. For more info, contact Rhonda or Peggy, (800) 722-6102.

For sale: **high quality frozen feeders**. Over a decade of production and supply. Seven sizes of mice available: small newborn pinks up to jumbo adults. Prices start at \$25 per 100. Feeders are separate in the resealable bag, not frozen together. Low shipping rates. Free price list. Kelly Haller, 4236 SE 25th Street, Topeka KS 66605, (913) 234-3358 evenings and weekends.

For sale: One-year-old captive-born armadillo lizards (*Cordylus cataphractus*), \$400 each. Born Oct 1999, these lizards are the ones that roll up into a ball when frightened. They can be very long lived, up to 25 years and are easy to maintain. Gary Fogel, (773) 935-6938 or E-mail: Kordylus@juno.com.

For sale: adult female Mexican milksnake, 5 years old, approx. 37" long, \$70. Mike Anderson, (847) 705-8976.

For sale: Why buy wild-caught royal pythons (*Python regius*) when you can buy healthy captive bred? I have babies available for \$40 each, complete with history (hatch date, feeding dates, etc). Also, aberrant California kingsnakes for \$25 each. All babies guaranteed feeding and sexed. Call Rich Crowley, (708) 485-5705 for details.

For sale: womas — c.b. babies, “starburst” phase, high-contrast strawberry banding, orange bellies, bright orange heads with supraocular black spots, feeding great on thawed fuzzies, unrelated available, \$3,000/pair, lone males, \$1250. Also, adult Mexican rosy boas, proven breeders, \$100 female, \$75 male, or \$150/pair; Macklot’s pythons yearlings, \$75 each; yellow anacondas, c.b. babies, \$75 each, \$50 each in lots of 10; screaming baby Brazilian rainbows, \$100 each. Mark Petros, (847) 854-3259, E-mail: turbovixens1@prodigy.net.

For sale: Send SASE to CRC, P.O. Box 0731, Las Vegas NV 89125-0731 for brochures and list of species available. Limited bookings available for guided tours of herpetological collection sites in Nevada. Call/fax (702) 450-0065. URL <http://www.herp.com/crc/> E-mail: crcsafetie@aol.com.

Free to good home: one c.b., 6'+, Everglades rat snake, beautiful red orange color, 7 years old, probable female (never probed), healthy and great feeder. David Bunker, (847) 615-2459 or E-mail: bhiproperty@ameritech.net.

Tours: Adventure tours to Madagascar! Join **Bill Love** seeing and photographing fauna and flora, heavily herp-biased, across the world’s least known mini-continent. Maximum fun & photo ops assured on every trip. Contact him at: BLUE CHAMELEON VENTURES, P.O. Box 643, Alva FL 33920. TEL: (941) 728-2390, FAX: (941) 728-3276, E-mail: blove@cyberstreet.com.

Tours: **Road-riding in Costa Rica!** Treat yourself to the trip of a lifetime! Learn about tropical herps, find them, photograph them, see where they live. **Greentracks, Inc.**, offers the best herpetological tours led by internationally acclaimed herpetologists and herpetoculturists. See the Amazon, visit cloud forests, experience the world’s greatest rainforest, super sunsets and good company. Call (800) 9-MONKEY.

Wanted: to purchase a living specimen of *Thamnophis sirtalis semifasciatus* from the Chicago area, for photographic purposes. Harlan D. Walley, Northern Illinois University, Dept. of Biological Sciences, Dekalb IL 60115, (815) 825-2057. E-mail: hdw@inwave.com.

Wanted: big-headed turtles; mata mata turtles; Mexican giant mud turtles (*Staurotypus triporcatus*); exceptionally large common snappers (45 lbs. & up); large alligator snappers (over 90 lbs.); spectacled caiman from Trinidad, Tobago and Surinam; dwarf caiman; smooth-fronted caiman; albino turtles (except red-eared sliders). Walt Loose, (610) 926-6028, 9:00 A.M. — 1:00 P.M. or after 11:30 P.M. Eastern Time.

Line ads in this publication are run free for CHS members — \$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to: Michael Dloogatch, 6048 N. Lawndale Avenue, Chicago IL 60659, (773) 588-0728 evening telephone, (312) 782-2868 fax, E-mail: [<MADadder0@aol.com>](mailto:MADadder0@aol.com).

MOVING??

Please let us know in plenty of time of any change in your mailing address. The *Bulletin of the Chicago Herpetological Society* is sent to our U.S. members by bulk-rate third class mail. This means that the U.S. Post Office will not forward your *Bulletin* with the rest of your mail. This is so even if you make a special request that your magazines be forwarded (such a request only applies to second class mail).

CHS MEMBERSHIP LIST AVAILABLE TO ALL MEMBERS UPON REQUEST

A listing of names and addresses of all members of the Chicago Herpetological Society, current as of August 2000, is available to members free of charge upon request. Send your request to Chicago Herpetological Society, 2060 N. Clark Street, Chicago IL 60614, or you may E-mail your request to Joan Moore at Joan.Moore@worldnet.att.net.

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will begin at 7:30 P.M., Wednesday, October 25, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. This meeting will feature workshops led by local CHS experts, covering various aspects of herpetoculture.

The November 29 meeting will include the annual election of officers and members-at-large of the CHS Board of Directors. After the voting, members' slides will be shown.

The Chicago Turtle Club

The next meeting of the Chicago Turtle Club will be Sunday, October 29, 1:00 – 3:30 P.M., at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Darrell Senneke of Tortoise Trust USA will speak on how to build a backyard habitat. Meetings are informal; questions, children and animals are welcome. Parking is free. For more info call Lisa Koester, (773) 508-0034, or visit the CTC website: <http://www.geocities.com/~chicagoturtle>.

NEW MEETING SITE

The regular monthly meetings of the Chicago Herpetological Society now take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful new building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

DONATIONS TO THE AUGUST 30 RAFFLE

The following is a listing of those businesses and individuals who generously donated items for our monthly raffle at the August 30 meeting. The donated items are shown in parentheses.

Pretty Pets (tortoise food); **Sunshine Mealworms** (cricket gift certificate); **Four Paws** (reptile claw clippers); **Timberline** (Easy Water cricket hydration gel); **Reptile Emporium** (InsectNside candy / Larvets mealworm snax); **Zoo Med** (bearded dragon food); **Fancy Publications** (*Reptiles* magazine subscription); **Super Pet** (Hanging Gardens cage decor / Floating Island / Rock Pool Cover / Island Sanctuary / ceramic dishes); **Hagen** (OrnamentAlls cage decor); **Don Wheeler** (cobra planter); **Karl & Erik Graff** (vitamins); **Emily and Will Forcade** (herp plush toy / herp night-light); **Jack Schoenfelder—Reptiques** (globe aquarium / herp memo holder); **Dr. Cheryl Roge—Best Friends Animal Hospital** (light fixture and bulb); **Ilene Sievert** (incubator / plants); **Lori King** (ceramic crocodile / dino book and videotape); **CHS** (T-shirt).

CHS BOARD RETREAT

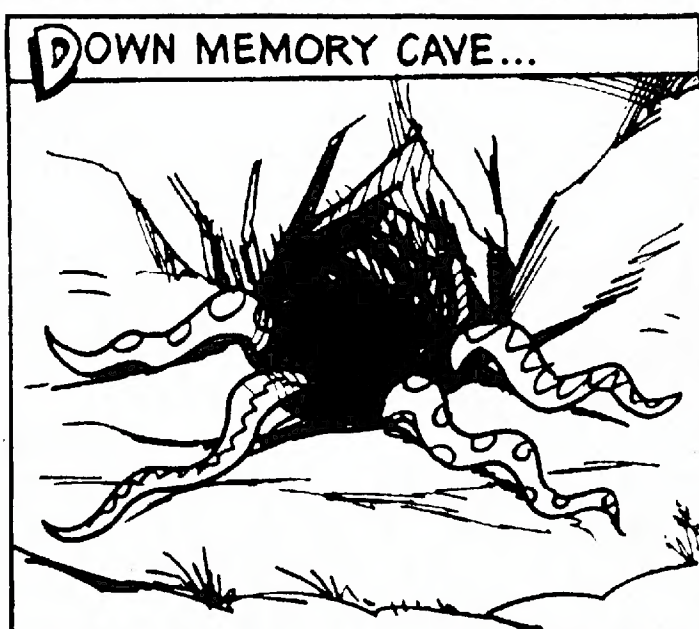
The board of directors of the Chicago Herpetological Society will hold a retreat to discuss the society's Mission, Vision, Values and Program Outcomes. The board also invites past board members, 2001 board nominees, and any other members concerned with the future direction of the CHS. A working lunch will be scheduled.

WHEN: November 11, 2000, 10:00 A.M. to 3:00 P.M.

WHERE: Ivy Tech State College, 2401 Valley Drive, Valparaiso, IN 46383

Please RSVP to Jack Schoenfelder, (219) 464-8514, jschoenf@ivy.tec.in.us, or mail to Ivy Tech State College at the above address.

THE ADVENTURES OF SPOT



NONPROFIT ORG.
U.S. POSTAGE
PAID
PERMIT NO. 9869
CHICAGO, ILLINOIS

CHICAGO HERPETOLOGICAL SOCIETY
Affiliated with the Chicago Academy of Sciences

2060 North Clark Street • Chicago, Illinois 60614
